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FLIGHT

AIRCRAFT, SPACECRAFT, MISSILES

Official Organ of the Royal Aero Club First Aeronautical Weekly in the World Founded 1909

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The Voices of America

NOT in the presidential campaign alone are American voices discordantly clamant. There is scant harmony among the spokesmen for air commerce. Let us listen to Mr Irving H. Taylor, export director of Aerospace Industries Association—America's SBAC. Mr Taylor is a worried man. Quoted by *Aviation Week*, he says that the Russian attack has already begun on the aviation front. US industry single-handed, he predicts, will have no possible chance of coping with this competition—give-away samples; long-term payment (possibly up to twenty years at two per cent deferred interest); and free technical assistance to customers. "The Russians," says Mr Taylor, "will eventually be offering products which will probably be by no means inferior to ours. The US Government will have to be prepared to support our industry in a big way or accept inevitable defeat in this area having important prestige and national defence aspects."

Mr Taylor does not sing his lament alone. Spokesmen for the Commerce Department have noted "the Soviet tactic of economic penetration through air transportation—aircraft sales followed by technical advisory crews—as a forerunner to political penetration." Concern is felt at the recent Russian inroad into Africa with the sale of four Il-18 turboprop airliners to Ghana and of four Il-14s (Czech-built) to Guinea.

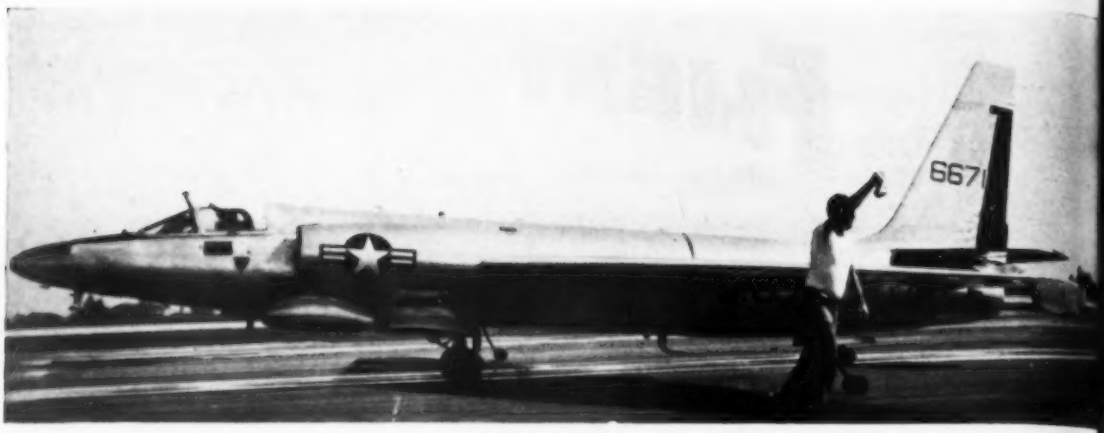
In Concert?

But enough of this minor key. Let us listen to more robust American voices, ready and willing as always to contribute to the concert. First we give ear to the robust tenor of Mr Elwood R. Quesada, Administrator of America's Federal Aviation Agency, who has lately returned from the USSR. The Tu-104, Mr Quesada reports, is by US standards a prohibitively uneconomical transport "with stick control forces equivalent to the B-17." But he adds that the Russians have Tu-104s "coming out of their ears" and are using them over the width and breadth of their country to "very good effect." Traffic control he describes as antiquated, and airline maintenance is often meagre.

Mr Quesada has quite cheered us up; and to dispel the blues finally we attend upon Mr Stuart Tipton, president of the US Air Transport Association. Russia's failure to develop jet airliners, he declares, is costing her a chance of competing in the world air travel market. The turboprop aircraft upon which the USSR has concentrated he considers to be at a big disadvantage with pure-jets on international air routes; and he adds (also having been in Russia): "We asked them if they had anything coming up in the way of newer jet transports and were told no, that they believe the turboprops are more efficient. They are trying hard, but they have a long way to go in equipment, passenger service and all the other factors that go into capable air transport."

So that dreaded "Russian attack" that Mr Taylor mentioned may not be so threatening after all. Or could it be that Mr Tipton at least has overlooked one or two discomfiting facts? That the Tu-114 is still largely unknown; that the An-24 is a new competitor for the Herald, Avro 748 and Friendship—a class that represents a sizeable slice of the world market; and that in the short-range turbofan category—another big slice of possible business—Russia has the Tu-124 already flying, though nothing comparable could be airborne here or in America in under two to three years.

The concert concludes with the *Red Flag* heard quite distinctly off-stage.



HASP—high-altitude sampling programme—is the task of the USAF's 4080th Strategic Reconnaissance Wing operating specially instrumented Lockheed U-2s. Here the pins have just been removed from the "pogo-stick" undercarriage outriggers, allowing them to fall clear after take-off

FROM ALL QUARTERS

Hawker Make New History

THE Hawker P.1127 VTOL/STOL strike aircraft, powered with a Bristol Siddeley BS.53 lift/thrust turbojet, began preliminary hovering trials at Dunsfold on October 21. The national Press did not fail to mark the significance of the event. "The Jumping Jet," ran a *Daily Express* front-page headline, followed by the sub-title "Up-along on same engine." The *Daily Mail* carried portraits of Sir Sydney Camm, under whose leadership this truly revolutionary aircraft was designed, and of Hawker chief test pilot Bill Bedford, who first took the P.1127 into the air. Pictures of some of the illustrious predecessors of the new aircraft were also printed. Nor did the vital contribution of the Bristol Siddeley team, under Dr Stanley Hooker, go unrecognized. The leader-writer of the *Sunday Express* was moved to convey his sentiments in these terms: "Once again the men of genius on this tiny island have shown that when they are allowed to they can still beat the rest of mankind put together."

In comparison the official announcement seemed a little stark. It ran: "Hawker Siddeley Group's P.1127, the world's first operational vertical take-off strike aircraft, today began preliminary hovering trials at Hawker's airfield at Dunsfold, Surrey. It was piloted by Mr A. W. (Bill) Bedford, the Hawker chief test pilot. The P.1127 is specifically designed for tactical strike reconnaissance duties and can also be used as a fighter. A number of development aircraft have been ordered by the Ministry of Aviation. Because of its vertical take-off and landing characteristics the P.1127 is independent of prepared airfields; it can also operate as a short take-off and landing (STOL) aircraft. This combination gives it a flexibility not possessed by any other high performance aircraft. The P.1127 has been designed around a single engine, the Bristol Siddeley BS.53, which provides both lift for vertical flight and thrust for wing-borne (forward) flight. A second Hawker P.1127 is scheduled for completion in a few months' time. No performance details can yet be issued."

The P.1127 was tethered, and hovered at a height of about 2[illegible]. Further hovering trials will be followed by short take-offs, using partly deflected thrust, and then horizontal flight, before the gap between hovering and forward flight is progressively narrowed to complete the transition.

The characteristics of the P.1127 were outlined in our "British Aircraft Industry" number of September 2, and the first detailed description of the BS.53 engine was printed in our issue for August 12.

Blackburn Chairmanship

AS we go to press it is learned that Sir Roy Dobson, managing director of the Hawker Siddeley Group, has been appointed deputy director and chairman of Blackburn Aircraft Ltd, which is a member of the group. Mr A. F. Jopling becomes deputy chairman.

Miles and BEAGLE

FOLLOWING the announcement that Mr George H. Miles was being appointed technical director to the co-ordinating board of the BEAGLE Group, under the chairmanship of Mr Peter Masefield, F. G. Miles Ltd have stated that planning is now going forward on the basis of a technical partnership between the company and the group and future activities are being worked out in detail.

Mr George Miles has commented that "any project that involves the design or construction of aircraft is essentially a continuous process—especially when it also involves the development of new business partnerships within a group with such objectives as this. The technical relationship between ourselves and BEAGLE, for instance, must necessarily be different from that between BEAGLE and Auster, the whole of whose share capital was acquired by the group. Obviously, the close working relationships which are envisaged in future will be to the benefit both of F. G. Miles as a company, and of its employees."

FROM RAE BEDFO[illegible] the Short SB.5 swe[illegible] wing research aircr[illegible] is seen taking off [illegible] October 18 with [illegible] wings swept back at [illegible] angle of 69°. This [illegible] the sharpest conti[illegible] sweepback on any [illegible] craft in the wo[illegible] Pilot on the 18[illegible] flight was Denis To[illegible] of RAE Farnbor[illegible]

FIRST of 36 de Havilland Beavers for the British Army on trial near Hatfield. The Army Air Corps Beavers will be stationed in Germany, Aden, the Far East and at Middle Wallop

EXPLAINING Jet Provost points to King Mahendra of Nepal is Hunting test pilot Dick Rumbelow (right). The King visited Vickers-Armstrongs at Weybridge and Hunting at Luton on the same day (October 19)

Montreal Meeting

PAPERS presented at the recent joint meeting in Montreal of the Canadian Aeronautical Institute and Institute of the Aerospace Sciences made reference to a de Havilland refinement to the General Electric T64 powerplant for the DHC Caribou, to an experimental engine suitable for either helicopter or light aircraft use and to a hypersonic ramjet satellite booster.

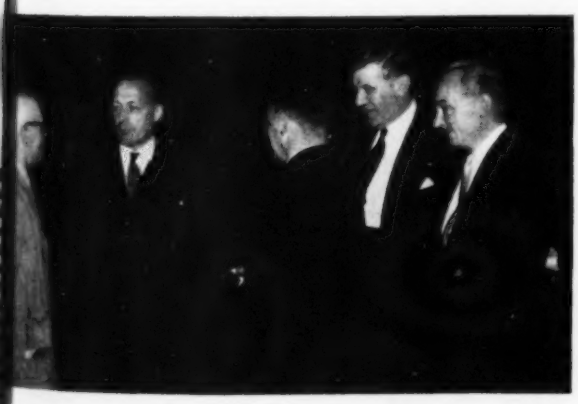
Mr D. H. Henshaw of de Havilland Aircraft of Canada described an inlet duct developed for the T64 which he said could give optimum engine performance and minimum fuel consumption. The company had determined the best design for the inlet by measuring the flow of electricity through mock ducts filled with water. Mr J. C. Vrana of Canadian Pratt & Whitney referred to the PT-6 500 h.p. turbine engine designed by his company; he said its characteristics included easier starting in cold weather, ability to use conventional propellers, simplified fuel control and better fuel consumption over a large range of applications. What was described as a "highly theoretical paper" was presented by Mr S. Molder and Mr J. H. Wu of McGill University on a hypersonic ramjet satellite booster that could improve space payloads by 30 per cent.

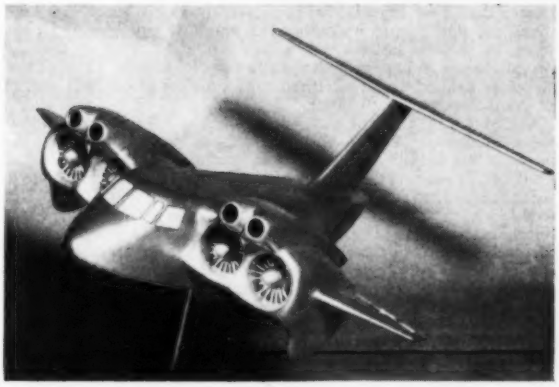
The FAI Conference

OVER 30 countries were represented by 161 delegates at the 53rd annual conference of the Fédération Aéronautique Internationale in Barcelona earlier this month. M Jacques Allez was elected to succeed Miss Jacqueline Cochran as president. An FAI Gold Medal was awarded to Pierre Satre, designer of the Caravelle, and De La Vaulx Medals went to Gerald Muselli (France), Gueorgui Mossolov (USSR), Maj Joseph Rogers (USA) and Gen E. Moore (USA).

Several types of Spanish aircraft appeared in an extensive flying display, which included Treble One Squadron and the USAF's Skyblazers, Chance Vought Crusaders and McDonnell Demons of the US Navy.

Before the display, it is reported, Gen James Stewart (alias James Stewart, film star) sent his best wishes to the participants through Paramount Films. He did this to coincide with the release in Barcelona of the Alfred Hitchcock production *The Man Who Knew Too Much.*





ADAM, standing for "air deflection and modulation," is the name applied to this projected VTOL/STOL aircraft by Chance Vought. Power will be provided by four turbojets driving ducted fans. The makers claim that the system is ideally suited for medium-range transport applications. Speed range could be from zero to 400kt

IN BRIEF

The first production order of 30 two-seater Lockheed Super Starfighters for West Germany has now been completed.

In addition to the four Ilyushin Il-18s ordered by Ghana Airways, ten more have been ordered for the Ghanaian Air Force.

Moscow Radio has reported the conversion of a number of Il-28s for upper-atmosphere research and to help in forecasting weather for Soviet jet airliners.

AVM T. O. Prickett, CB, DSO, DFC, since May 1958 Senior Air Staff Officer at No 1 Group, Bomber Command, is to be Assistant Chief of Air Staff (Operations) at the Air Ministry from December 1.

The Saunders-Roe SR-N1 is due to be demonstrated today, October 28, to members of the Southampton Harbour Board so that questions of legislation affecting the operation of hovercraft in harbours and shipping lanes can be considered.

A fire which damaged the A. V. Roe factory at Chadderton, near Oldham, Lancs, last weekend was the fourth which had occurred there in just over twelve months. The company's managing director, Mr J. A. R. Kay, commented that the possibility of sabotage could not be ruled out. He said there had been no damage of any significance to aircraft under construction.

A free 132-page book of motoring information, *The Autocar Motorists' Companion*, is being offered by our associated journal *The Autocar*. It will be given away in four 32-page sections, the first with today's (November 4) issue and the others with those of November 11, 18 and 25. Details of a £2,500 competition are published in this week's (October 27) issue of our associated journal *The Motor Cycle*.

VISITING BROUGH: Mr Harold Watkinson, Minister of Defence, seen on his recent visit to Blackburn Aircraft Ltd at Brough. The Minister is talking to Mr F. W. Gosney, convener of shop stewards (left) and is accompanied by Mr T. Bancroft, production director, Mr A. F. Jopling, deputy chairman, and Capt E. D. G. Lewin, joint managing director

SMITHS DISCUSS AUTOMATIC LANDING

First Details of Some Practical Research

ON Thursday of last week Mr A. M. A. Majendie, director of operational requirements, Smiths Aviation Division, presented a most significant paper to a meeting of the Guild of Air Pilots and Air Navigators. Entitled *Aspects of Instrument Development for All-Weather Operation*, the lecture for the first time presented information and films on some of Smiths practical work on triplex autopilots, director instruments and automatic landing in general. Mr Majendie gave some of Smiths' estimates of reliabilities to be achieved by various combinations of equipment, discussed instrument displays and showed that the human pilot could not effectively take part in the automatic landing process. In some significant ways Smiths' thinking seems to agree with the conclusions drawn by Elliott Brothers (London) and expounded in an important series of articles in *Flight* for October 7.

Mr Majendie said that the landing problem was to control the aircraft so that the wheels touched down on the runway within fairly narrow longitudinal limits and at a sinking speed not much greater than 1 or 2ft/sec. An approach speed margin 30 per cent above the stall should be reduced to about 15 per cent at touchdown by throttle control, the wings should be levelled and the aircraft yawed to line up with the runway centre-line. Control was therefore needed about all three axes simultaneously and also of airspeed through the throttles.

Mr Majendie recalled that 40 per cent of all airline accidents occurred during landing and that human pilots had shown an accident rate of four in every million landings—a figure which had "stubbornly resisted the tremendous efforts that have been made to reduce it." Despite all recent work no instrument system had remotely approached the standard necessary to give the pilot visual references as good as those of the outside world. Development had therefore been concentrated on providing a fully automatic solution; and this was logical in such a highly repetitive, short-term and complex control process as landing.

The speaker said that the provision of adequate monitoring information for the pilot was extremely difficult and that, following a critical malfunction in the presence of the ground, it was "extremely unlikely that any pilot would be able to intervene quickly enough to prevent a disaster." Any ground guidance system replacing direct vision must have the same reliability as the airborne equipment and therefore possess effective monitoring and stand-by arrangements. No serious attempt had yet been made to provide a guidance system using other than electromagnetic signals and it was unlikely that any other solution would be found in the foreseeable future.

Reviewing the present situation, Mr Majendie said that present forms of flight director instruments were concerned solely with pitch and bank control and this was not suitable for the complex adjustments needed when landing. Because some external objects became visible before touchdown in nearly every landing, even in thick fog, the pilot had a strongly compulsive desire to look out of the windscreen and was thereby distracted from his flight instruments. This was the classic dilemma of transition. Autopilots with approach couplers had to be disconnected at about the critical height and their main advantage was in reducing work-load and controlling the aircraft accurately while the pilot assessed his position on first seeing the ground. Current flight directors and autopilots had failure rates far below the required level of safety for automatic landing, and it was now generally agreed that airline automatic landing equipment should present an accident risk no greater than one in 10 million. Scientific evidence must determine whether a particular system met the requirements and individual opinions gathered as the result of a few hundred test landings could not help in this assessment.

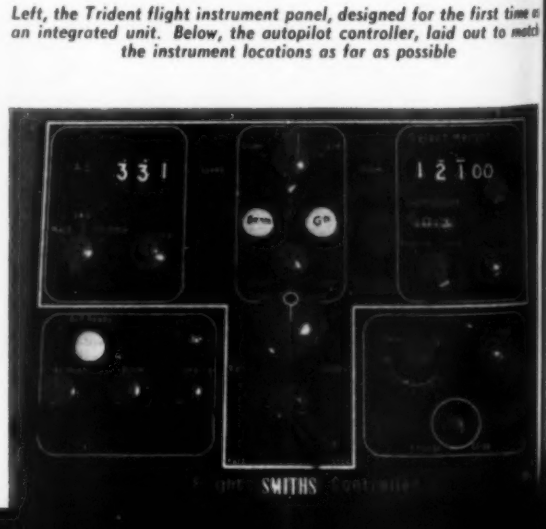
If a manual solution was sought, director control was needed in pitch, bank and yaw, for throttles to control airspeed, and for yaw/roll interaction and pitch/throttle interaction. Full monitoring was necessary. Temporary failure to control any one of the functions during the 10sec preceding touchdown could be disastrous, and the reliability of the pilot and the system together should meet the one in 10 million safety criterion. Few current director systems had an MTBF better than 2,000hr, and 1,000hr was typical. The prospect of achieving adequate safety and reliability was therefore remote, before taking any account of the human task involved. If the number of quantities involved could be reduced, e.g., by using automatic throttles and a yaw damper, the primary task would be reduced to pitch and bank control and drift kick-off. Smiths had tried such a system using PVD, but in virtually zero cross-wind. There had been two crew members in addition to the pilot, a co-pilot and a systems specialist. A properly trained third pilot could have replaced the systems specialist. Blind landing under these conditions, with virtually no cross-wind, was possible but not sufficiently safe for passenger-carrying operations.

Mr Majendie listed the deficiencies of four visual systems which had been considered for manual blind landing, the BLEU Tele-Viewer, the ANIP contact analogue, optical projection systems and the Smiths PVD. Tele-Viewer had been used for several manual blind landings, but its reliability could not begin to match up to requirements. The input information was markedly inferior to direct vision and would increase human malfunction rate; and the two large displays needed would prove very difficult to install in a cockpit. Contact analogue generation was extremely complicated and even partial failure of the display would make it meaningless. The analogue picture, viewed though a transparent flat TV tube might seriously interfere with the pilot's assessment of the outside scene when he first saw it on leaving cloud.

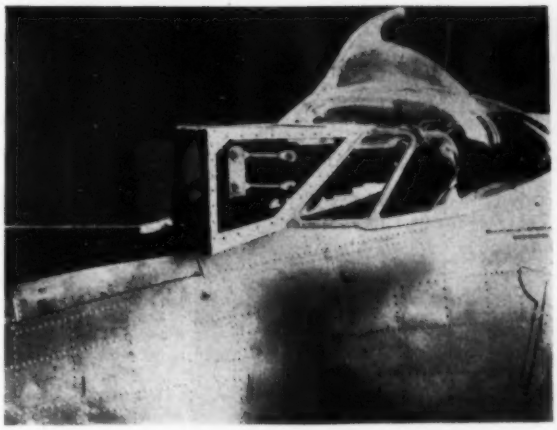
Optical projection on to the windscreen did not solve the basic instrument presentation problem. The pilot's head had to remain exactly aligned for the display to be visible and very powerful lamps were needed for daylight viewing. The failure rate of these lamps would have to be equal to the overall requirement. Correlation of the outside view with the projected display was difficult, raising accuracy, alignment and fixation problems. PVD had the considerable advantages already outlined, but did not solve the problem of manual blind landing.

At this stage an excellent colour and sound film was shown of PVD flying in a Dove, with some remarkable sequences of a PVD-directed ILS landing at Gatwick in rain on a pitch-dark night. Photographic and technical interest and quality were equally high.

Having effectively eliminated both manual control and manual take-over from the automatic landing process, Mr Majendie now turned to automatic solutions. There were, he said, only two complete systems today which warranted serious consideration, the BLEU Autoland system and the Bell AN/GSN-5. He emphasized the wide experience already accumulated by BLEU and that Autoland was available from production sources. The Bell system was attractive in requiring very little equipment in the aircraft, but it split complete control between ground and airborne units and was exceedingly difficult to monitor or protect against failure. At the most critical point the aircraft was in radar ground clutter and drift kick-off was not yet effectively provided. The FAA had



Left, the Trident flight instrument panel, designed for the first time as an integrated unit. Below, the autopilot controller, laid out to match the instrument locations as far as possible



Tele-Viewer, simulated in a BLEU Devon by closed-circuit television, and used for some manual blind landings. The display is in the windscreen and part of the camera housing is just visible above the nose on the left

stated that the Bell system was not considered for civil transport use.

Analysis of Smiths SEP.2 autopilot (like those used in Autoland) during more than 1.5 million flying hours had shown an expected failure rate, if the equipment was serviceable at 200ft on the approach, of 4×10^{-5}—a whole order worse than needed for civil automatic landing, but adequate for military use.

The SEP.5 autopilot, now in prototype development, was intended to provide the required level of safety, and a film was shown to illustrate some of the work on triplex servos and the flying of a Dakota with a triplex elevator circuit. Various run-away failures were shown simulated with single-channel and triplex control, both on a laboratory rig and in the Dakota, with impressive results. The triplex controls were now being fitted in a Comet 2E. A BLEU film of automatic landings with a Varsity also showed briefly how the system worked and contained air-to-air sequences of landings where considerable drift was kicked-off just before touchdown.

SCALE OF EQUIPMENT		PROBABILITY OF	
SUB-CHANNELS FOR EACH AXIS OF CONTROL	SOURCES OF RADIO GUIDANCE	ARRIVING AT 200ft. UNSERVICEABLE FOR AUTOMATIC LANDING	MALFUNCTION DURING LANDING IF FULLY SERVICEABLE AT 200ft.
1	1	$2{\cdot}4 \times 10^{-2}$	4×10^{-5}
2	2	$2{\cdot}4 \times 10^{-2}$	$6{\cdot}7 \times 10^{-5}$
3	3	$1{\cdot}2 \times 10^{-3}$	$3{\cdot}3 \times 10^{-9}$
3	DISCOUNTING RADIO	$2{\cdot}4 \times 10^{-5}$	6×10^{-10}
4	DISCOUNTING RADIO	$1{\cdot}1 \times 10^{-8}$	8×10^{-15}

Representative probabilities of autopilot failure calculated by Smiths for normal equipment reliabilities. Note the low values in the first probability column, and the improvement if radio is not considered. New radios now in prospect will be more reliable

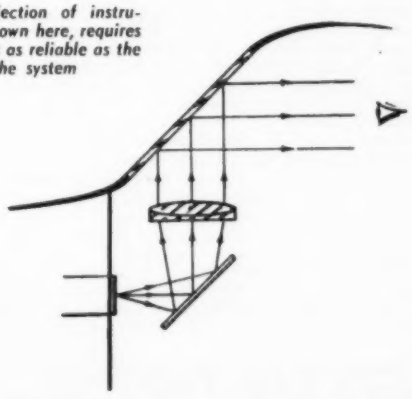
Mr Majendie did not go into great detail on the triplex concept except to say that the problem of synchronization and nuisance cut-outs in rough air had been effectively overcome. Most significant was the table reproduced above giving the failure probabilities of various combinations of equipment. It was clear that equipment which met the requirement during the landing period would not necessarily show anything like the same reliability over complete flights and that radio was one of the major sources of failure. New radio equipment now being produced offered very considerable improvements in reliability.

Mr Majendie next turned his attention to the ground guidance aids and stated categorically that ILS localizer to the standards prescribed in ICAO Annexe 10 was not accurate or stable enough for regular use in automatic landing although it had been used in a large number of test landings, some of them in thick fog. A determined effort was being made in America to improve ILS, but, the speaker said, there seemed to be no equivalent effort in England. Leader Cable provided an effective final azimuth guidance, but installation problems and international standardization stood in its way. ILS glide-path had to be improved to match the general equipment. Mr Majendie did not mention centrimetric systems.

Considering the overall automatic landing system, he said that it had to be matched with suitable instrument displays and control panels and he showed these items, illustrated here, as developed for the D.H. Trident. Experience had shown that there was little difficulty in taxying as long as centre-line lights were visible; and they remained so even in all but the thickest fog. R.C.A. in America and the British Road Research Laboratory had done some work in controlling vehicular traffic from cable guidance and Smiths had given "more than passing attention to this problem." Steering control during landing and take-off were an extension of the taxying case and centre-line lights would cover nearly all cases. Totally blind steering signals were a marginal requirement which could undoubtedly be met if necessary. Rotation and initial climb on take-off remained a problem but were not particularly relevant to all-weather operation.

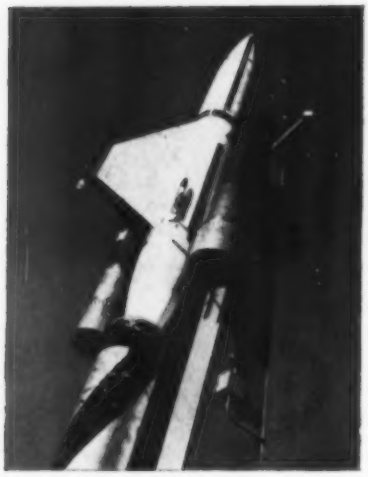
Of great interest was Mr Majendie's forecast of multiplex automatic systems together with miniature and flexible digital airborne computers which could provide "ultra-human capability." They could work faster and more reliably and handle more variables than any human being could possibly hope to manage. They would have obvious applications in VTOL and supersonic vehicles and the function of the man in systems of this kind would be as systems manager and also as a monitor to ensure that the automatic controls were not required to operate in conditions for which they had not been designed. Operational applications would necessarily be limited to those foreseen by the designers. Much work would be needed to establish the correct relations between an ultra-human control system and its human supervisor. Scheduled automatic landing was on the threshold of such problems. Mr Majendie felt sure that the Guild would give powerful support in assisting in this essential metamorphosis of the man from "sleight of hand artiste" to highly qualified systems manager.

In reply to questions, Mr Majendie made various points. "Hotter" aircraft required assistance for the pilot in landing. Leader Cable meant that control was split between two systems with a resultant need for change-over relays which degraded system reliability. The glide-slope angle of 2½° which was now favoured seemed adequate for automatics. The runway length required when performing automatic landings was largely defined by the touchdown impact (and therefore the spread of touchdown points) which the operator would accept from the point of view of passenger comfort. Automatic landing would be introduced gradually, first at specific well-equipped airfields. Fuel reserves could be progressively reduced at a later stage, the most immediate aim being familiarization and then an increase in safety and regularity of operation. The Trident would first operate with a duplex autopilot supported by PVD for manual take-over forming a third channel. [The duplex autopilot provides only passive failure characteristics and would not continue to operate after a fault.] Mr Charnley of BLEU pointed out that ILS airborne receivers had to be sufficiently accurate to exploit the quality of the ground equipment and that problems of interference from over-flying aircraft and extremely close tolerances were being investigated. There was more than ILS performance to worry about.



Windscreen projection of instrument displays, shown here, requires very bright lamps as reliable as the rest of the system

Missiles and Spaceflight



First photograph of Robot 322, a Swedish research missile with rocket booster and twin ramjet sustainers, on its launcher. A product of the Royal Swedish Air Board, this missile has presumably been overtaken by that country's order for Bloodhounds

ADVICE FOR BRITAIN

The possibility of using Earth satellites for communications is being discussed at a series of technical meetings in the United States between British government officials and members of the National Aeronautics and Space Administration, Defense Department and private companies. The British team's visit began last Sunday and was expected to last three weeks.

Led by Maj-Gen Leslie de Malapert Thuillier, assistant secretary in the Cabinet office and former War Office Director of Telecommunications, the British party includes four GPO officials, Mr J. R. U. Page of the Ministry of Science; Mr F. E. J. Girling, Mr A. G. Earl and Mr C. Williams of the Ministry of Aviation; Mr F. A. Kitchen of the Admiralty; and Gp Capt A. Foden and Mr C. F. Sutton of the Ministry of Defence.

LONG-DISTANCE CALLS

The American Telephone & Telegraph Company requested US government permission on October 21 to place a communications satellite in orbit "within a year." This would provide experimental transmission of telephone calls, television and other types of communication between the USA, Britain and the European continent, and would be the first commercial satellite.

Mr Henry T. Killingsworth, company vice-president in charge of long-distance service, said: "We believe the commercial application of satellite communications is a job for private enterprise. This new project is still another indication of our readiness to take on that job and pay our own way." In applying for the necessary permission the company said it was now prepared to contract for the launching of the satellite and to proceed with construction of ground transmitting and receiving stations. The project would be financed and operated by the company in co-ordination with telephone services abroad. No immediate estimate of the total cost involved was available.

Mr Killingsworth said: "We expect the initial satellite will be capable of transmitting up to about 35min some three or four times a day—co-ordinated with the satellite passes over the Earth station areas. The satellites would act as microwave towers in the sky, performing the same boosting and transmitting functions as the microwave towers of our radio relay system on the ground."

SOVIET POLARIS-TYPE SUBMARINES

According to a statement by Mr Kruschev on October 20, the Soviet Union now possesses atomic-powered submarines capable of firing missiles. The occasion was a report delivered in Moscow by the Soviet premier on his recent visit to the United Nations General Assembly in New York, and followed a reference to "a note . . . in the American Press that the Pentagon had decided to send submarines armed with rockets with nuclear warheads which would cruise in the Baltic Sea close to the shores of the Soviet Union.

"American generals and admirals cannot but know," Mr Khruschev went on, "that our country also has submarines with atomic engines armed with rockets."

BIG BOOSTERS ON THE BOARD

Three US companies have been selected by NASA to carry out preliminary design studies on "super-size" solid-fuel boosters for vehicles weighing between 1,000,000 and 7,000,000lb, with booster thrust levels from two to three times the vehicle weight. The firms are Aerojet General Corp, Grand Central Rocket Co and the Thiokol Chemical Corp.

Grand Central will study and design a solid first stage for vehicles in the one-million-pound class; Thiokol a first stage for a seven-million-pound vehicle; and Aerojet General stages for vehicles in both these categories. Largest solid-fuel stage flown to date in the United States is the Algol first stage of Scout, which weighs over 22,000lb and develops approximately 115,000lb.

These new studies, which will cover a six-month period at a total cost of some $225,000, follow two general investigations into the performance of large solid-propellant boosters completed last year for NASA by Lockheed Aircraft Corp and the Aeronutronic Division of Ford Motor Co.

As well as specific designs for first-stage solid-propellant boosters, the three firms will also complete general designs of liquid-fueled upper stages where necessary to obtain realistic vehicle performance. Details of unit and development costs, fabrication methods, logistics and methods of mating to upper stages are to be included. The three companies will co-ordinate their studies with NASA's Marshall Space Flight Center at Huntsville.

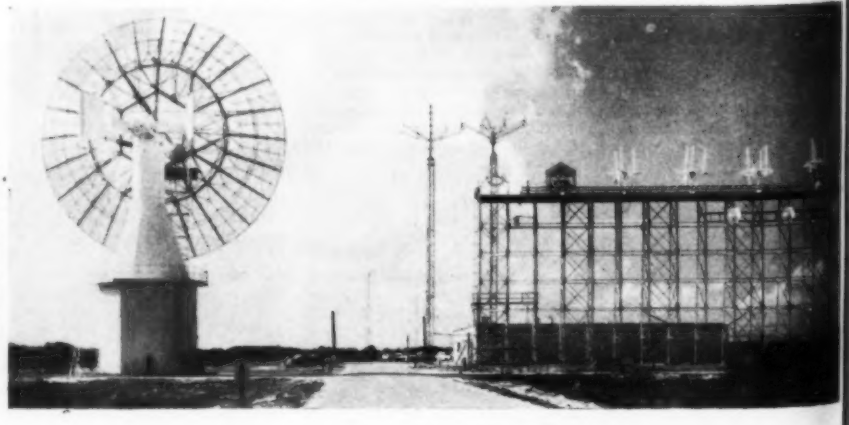
SCOUT CONTRACT ANNOUNCED

A six-million-dollar contract has been awarded to Chance Vought Aircraft Co as prime contractor for the Scout launch vehicle system. This was announced last week by the National Aeronautics and Space Administration.

Scout development began at NASA's Langley Research Center in mid-1958. Under Langley management, Chance Vought was the contractor for launch-tower fabrication and manufacture of airframes and motor transition sections. Under the new arrangement, Langley will retain technical direction of the vehicle.

Chance Vought's responsibilities as prime vehicle contractor will include final assembly and launch. Individual guidance and control packages will be shipped to the company at Dallas, Texas, where the four stages will be assembled for final testing and acceptance. The four constituent rocket motors—Algol, Castor, Antares and Altair—will continue to be made available as "Government-furnished equipment."

The third Scout launch, the first in which an orbital shot will be attempted, is expected to be made before the end of the year.



A varied spread of aerials at Cape Canaveral. At Receiver Building No 2 on the north side of the Missile Test Annex, these aerials are used to receive tracking data and telemetry from missiles and spacecraft launched down the Atlantic Missile Range. The big dish on the left is a TLM-18 steerable reflector, one of two used at the Cape. The other will be employed in connection with the Project Mercury manned-satellite programme

Missiles and Spaceflight . . .

VANDENBERG COUNTDOWN

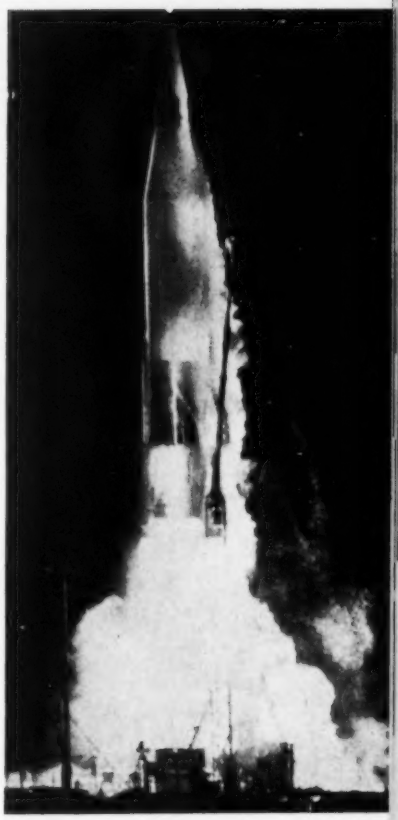
A complete list of major missile and satellite launchings from Vandenberg Air Force Base, California, since its inception as a launching site, is given in the table below. This is correct to October 20, 1960.

Date	Agency	Missile	Remarks
Dec 16, 58	SAC crew	Thor	Successful
Feb 28, 59	AFBMD	Discoverer 1	Successful orbit
Apr 13, 59	AFBMD	Discoverer 2	Successful orbit—no recovery
Apr 16, 59	RAF crew	Thor	Successful
Jun 3, 59	AFBMD	Discoverer 3	No orbit
Jun 16, 59	RAF crew	Thor	Destroyed in flight
Jun 25, 59	AFBMD	Discoverer 4	No orbit
Aug 3, 59	RAF crew	Thor	Successful
Aug 13, 59	AFBMD	Discoverer 5	Successful orbit—no recovery
Aug 14, 59	RAF crew	Thor	Successful
Aug 19, 59	AFBMD	Discoverer 6	Successful orbit—no recovery
Sep 9, 59	SAC crew	Atlas	Successful
Sep 17, 59	RAF crew	Thor	Successful
Oct 6, 59	RAF crew	Thor	Successful
Oct 21, 59	RAF crew	Thor	Successful
Nov 7, 59	AFBMD	Discoverer 7	Successful orbit—no recovery
Nov 12, 59	RAF crew	Thor	Successful
Nov 20, 59	AFBMD	Discoverer 8	Successful orbit—no recovery
Dec 1, 59	RAF crew	Thor	Successful (first night shot)
Dec 14, 59	RAF crew	Thor	Destroyed itself (night)
Jan 21, 60	RAF crew	Thor	Successful
Jan 26, 60	SAC crew	Atlas	Successful
Feb 4, 60	AFBMD	Discoverer 9	No orbit
Feb 19, 60	AFBMD	Discoverer 10	Destroyed in flight
Mar 2, 60	RAF crew	Thor	Successful
Apr 15, 60	AFBMD	Discoverer 11	Successful orbit—no recovery
Apr 22, 60	SAC crew	Atlas	Successful
May 6, 60	SAC crew	Atlas	Destroyed in flight
Jun 22, 60	RAF crew	Thor	Successful
Jun 29, 60	AFBMD	Discoverer 12	Successful launch, no orbit
Jul 22, 60	SAC crew	Atlas	Destroyed in flight
Aug 10, 60	AFBMD	Discoverer 13	Successful orbit, recovery
Aug 18, 60	AFBMD	Discoverer 14	Successful orbit, air catch
Sep 13, 60	AFBMD	Discoverer 15	Successful orbit, re-entered away from planned area, sank in sea
Sep 12, 60	SAC crew	Atlas	Unsuccessful — propulsion system failure
Sep 29, 60	SAC crew	Atlas	Unsuccessful
Oct 11, 60	RAF crew	Thor	Successful
Oct 12, 60	SAC crew	Atlas	Unsuccessful

Notes: AFBMD, US Air Force Ballistic Missile Division; SAC, Strategic Air Command.

The new 50,000lb thrust XLR-99 rocket engine (by Reaction Motors Inc division of Thiokol) being fitted recently to the third X-15 research aircraft at Edwards AFB, California. The motor is fully controllable and can be stopped and re-started during flight

Five thousand miles' range and 700 miles' altitude were achieved by this Atlas, launched on October 13 from Cape Canaveral and carrying as passengers black mice Sally, Amy and Moe from the USAF School of Aviation Medicine at Brooks AFB, San Antonio, Texas (reported in last week's issue)



FOUR BULLS FOR PATRICK HENRY

It was announced by the US Navy on October 19 that between October 15 and 18 the second Fleet Ballistic Missile Submarine, USS *Patrick Henry*, fired four Polaris A-1P missiles down the Atlantic Missile Range with complete success. In previous launchings from *Patrick Henry* and her sister *George Washington* the launch point has been close to Cape Canaveral. These four firings, however, started some 500 miles down-range in order to "take advantage of the near-operational conditions which could be achieved by eliminating most of the restrictions and instrumentation required when firing missiles near populated areas." It was stated that all four Polaris went the full programmed range and impacted in the target area.

MILITARY/CIVIL SPACE CO-ORDINATION

Top-management representatives of the US National Aeronautics and Space Administration and of the Department of Defense are now serving on the newly formed Aeronautics and Astronautics Co-ordinating Board to ensure "continuing co-ordination of the nation's aeronautics and space programs." Objects of the board are to review planning to avoid duplication; co-ordinate activities of common interest; identify problems requiring solution by either NASA or the Defense Department; and ensure a steady exchange of information.

Co-chairmen of the board are the Director of Defense Research and Engineering and the Deputy Administrator of NASA—respectively Dr Herbert F. York and Dr Hugh L. Dryden. Specialized panels have been formed to study launch vehicles, manned spaceflight, spaceflight ground environment, unmanned spacecraft, supporting space research and technology, and aeronautics.

WORLD RECORD ORBITS

It was announced on October 4 by the International Sporting Committee of the Fédération Aéronautique Internationale that agreement had been reached between the United States and the Soviet Union on the basic framework within which rules pertaining to space "records" could be drawn up. The FAI will in future recognize properly instrumented and supervised space flights which qualify for the title of "highest," "longest" or "greatest weight lifted." To qualify for consideration, each mission must reach an altitude of at least 100km (62.1 miles), bring back all living passengers unharmed and exceed the previous record by at least 10 per cent.

The first corporate members of the British Interplanetary Society are the Aviation Branch of Air BP Ltd, and Sud-Aviation. This new grade of membership is open to "industrial, scientific, educational and other organizations," and costs £100 per year.

Among a number of studies in plasma physics, the Missile System Division of Republic Aircraft Corporation is engaged in an advanced project concerned with anti-ICBM techniques. Theoretical studies are being made of the properties of plasma generated during nuclear explosions, evaluating its possible destructive effect on warheads and communication. The possible relationship is being examined, also, of microwave radiation transfer, concerning the interaction between a microwave beam and the plasma sheath surrounding a re-entry or orbital object.

SATELLITE CENTRE

GREENBELT, Maryland, is as pleasant a place as one would expect from such an evocative name. Autumn leaves were daubing the woods with magnificent splashes of red, and the atmosphere was wholly relaxing, as we turned off the Greenbelt - Glendale road some 12 miles north-east of Washington. The sign at the side of the newly surfaced side-road read GODDARD SPACE FLIGHT CENTER. NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. ARCHITECTS VOORHEES, WALKER, SMITH, SMITH AND HAINES. A long, low building, still under construction, was visible in a clearing in the trees as we pulled up in front of one of two completed buildings, freshly modern and bright in the sun, on the opposite side of the road.

From that point on the atmosphere became anything but relaxing, for NASA's Goddard Center is one of the most stimulating places in the spaceflight business at the present time. Ideas, designs, hardware, testing, data processing, theoretical research, manned spaceflight, scientific and applied spacecraft, control and communications, all are included in the work of this, the space agency's youngest and fastest-growing research-minded baby.

Named in memory of Robert H. Goddard, the American pioneer in rocket research, the centre at Greenbelt is one of three in which NASA's development of space vehicles and payloads is now mainly concentrated. The other two are the George C. Marshall Space Flight Center at Huntsville, Alabama, and the Jet Propulsion Laboratory of California Institute of Technology at Pasadena, California. The respective roles of the three are that Marshall is responsible for the design and development of launch vehicles and the supervision of NASA launches at the Atlantic and Pacific missile ranges; Goddard for Earth satellite programmes and manned spaceflight, including Project Mercury; and JPL for mission planning and the development of payloads for lunar and interplanetary exploration.

This division of responsibility between the three centres on the basis of launch vehicles, Earth satellites and deep-space probes is not absolutely rigid—the Scout rocket is handled at Langley Research Center, for example, and Goddard has been concerned with the Delta firing programme and with the lunar-orbiting probe carried by Atlas-Able 5—but is followed as a general rule. The Goddard Center and the Jet Propulsion Laboratory come under the NASA Office of Space Flight Programs, whose director is Dr Abe Silverstein; while the Marshall Center at Huntsville is a facility of the Office of Launch Vehicle Programs under Gen Don R. Ostrander.

Much of the challenging atmosphere at Goddard stems from the enthusiasm of a team which is building-up a major research facility from scratch. Eighteen months ago there was nothing but a 550-acre plot forming part of the government's Beltsville Agricultural Center. At the time of my visit earlier this month some 450 people were employed at Goddard, occupying the two completed blocks shown in the heading sketch. Other NASA personnel who will eventually move into the new centre are at present housed at the Naval Research Laboratory and other units in the Washington area and at Langley Research Center, Langley Field, Virginia. The third building (of a total of eight which have been authorized to date) is now almost complete at the Greenbelt site; the number of people employed will increase from the present 1,500 to 2,000 by June 1961; and the initial building plan should be complete, at a total cost of $27.5m, by the end of 1962.

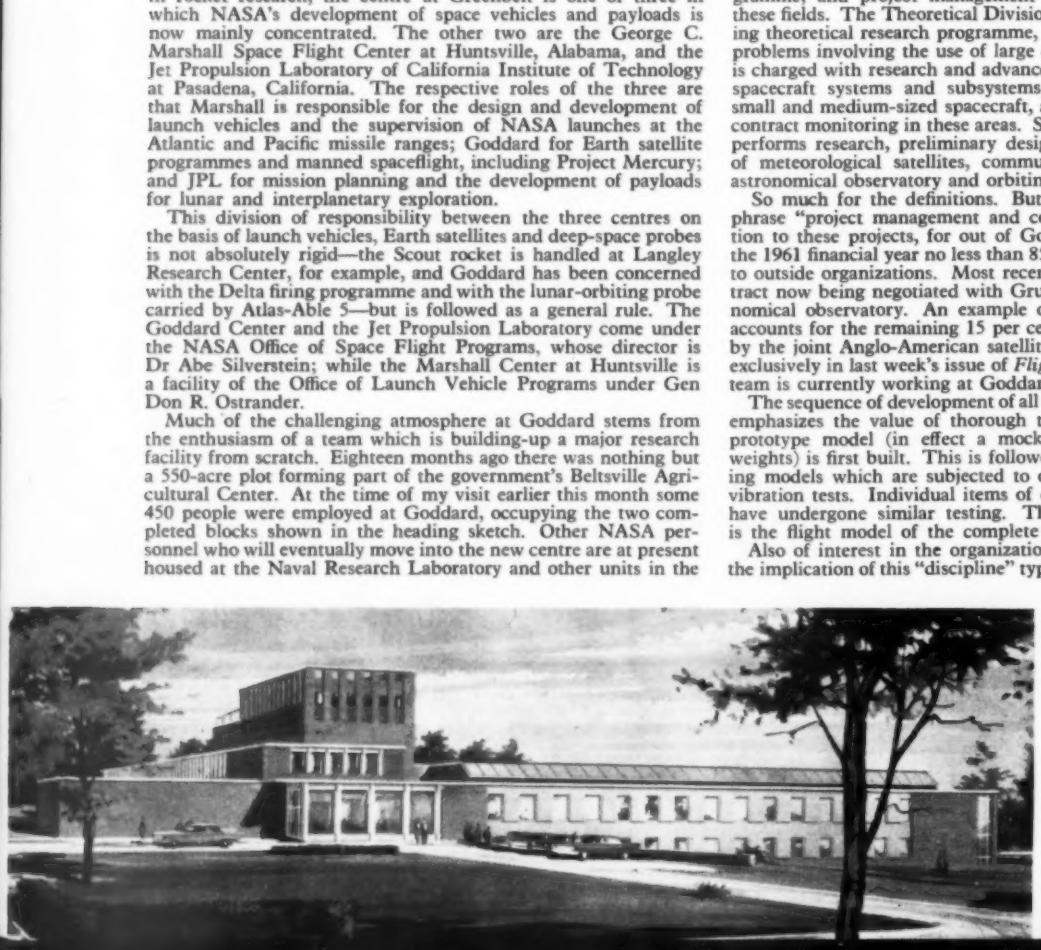
Under its director, Mr Harry J. Goett, Goddard Space Flight Center is organized into three main research and development groups, plus a business administration group and a technical services department. The R and D groups are concerned respectively with manned satellites; tracking and data systems; and space science and satellite applications; and are headed by assistant directors Robert R. Gilruth, John T. Mengel and John W. Townsend Jr. Mr Gilruth is also director of the Project Mercury Space Task Group, at present located at the Langley Center.

The Space Science and Satellite Applications group is split into four divisions. These are the space sciences, theoretical, payload systems and satellite applications systems divisions. Space Sciences is concerned with the experimental space-sciences research programme, support of NASA's sounding-rocket programme, and project management and contract monitoring in these fields. The Theoretical Division carries out the corresponding theoretical research programme, and tackles special analytical problems involving the use of large computers. Payload Systems is charged with research and advanced technical developments in spacecraft systems and subsystems, design and integration of small and medium-sized spacecraft, and project management and contract monitoring in these areas. Satellite Applications Systems performs research, preliminary design, and project management of meteorological satellites, communications satellites, orbiting astronomical observatory and orbiting geophysical observatory.

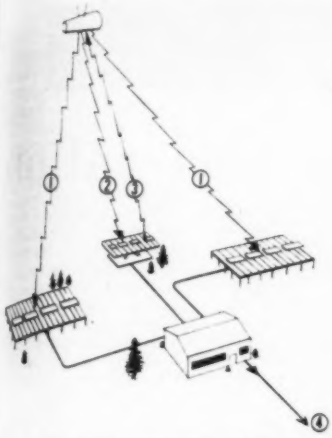
So much for the definitions. But it is of interest to note the phrase "project management and contract monitoring" in relation to these projects, for out of Goddard's $221.5m budget for the 1961 financial year no less than 85 per cent is being contracted to outside organizations. Most recent major example is the contract now being negotiated with Grumman for an orbiting astronomical observatory. An example of the in-house effort which accounts for the remaining 15 per cent of the budget is provided by the joint Anglo-American satellite International 1 (illustrated exclusively in last week's issue of *Flight*), on which a small design team is currently working at Goddard.

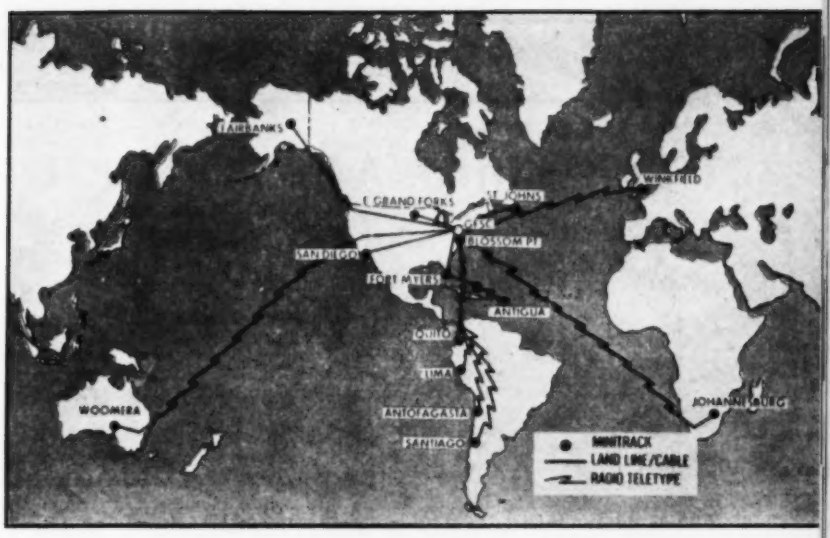
The sequence of development of all satellites handled at Goddard emphasizes the value of thorough testing at an early stage. A prototype model (in effect a mock-up accurate in space and weights) is first built. This is followed by one or more engineering models which are subjected to complete environmental and vibration tests. Individual items of equipment would previously have undergone similar testing. The final version constructed is the flight model of the complete satellite.

Also of interest in the organization of the Goddard Center is the implication of this "discipline" type of framework on particular



First trio of buildings to be completed at Goddard are (heading picture) the space projects building and, in background, research projects laboratory; and (left) central flight control and range operations laboratory





Right, worldwide tracking and communications network; above, typical tracking station. 1, tracking; 2, telemetry; 3, command-interrogation; 4, data transmission to Goddard SFC

projects. Unlike other research establishments which are organized on a project basis, Goddard is employing what amounts to an attempt to integrate the two types of organizational structure.

At the outset of a spacecraft project the project manager, who typically could be a member of the Satellite Applications Systems Division, will be assisted by a project scientist (from the Space Sciences Division) and a tracking scientist (from the Tracking and Data Systems Group), as well as by other members of the project team, in planning the significant "milestones" in the programme. Schedule dates are decided and progress charts are prepared. As the programme develops the project manager makes bi-weekly reports (on the basis of information from his team or the outside contractor) covering both general status and individual achievements compared against the progress chart, to both the director of the centre and to NASA headquarters. Because of the "discipline" element of the organization, the project managers also meet regularly with their division chiefs.

Tracking and communications in connection with Earth satellites will soon be handled in the new Central Flight Control and Range Operations Laboratory illustrated on the opposite page. In the meantime, in one of the two existing buildings, the space operations control centre (code-named Spaceconn) is an extremely busy place, particularly in the hours immediately following a launch. To the accompanying background chatter of a roomful of teleprinters, I was told something of the worldwide communications network (see diagram) which has Goddard as its focal point.

By land-line, cable or radio-teletype, Spaceconn is linked to approximately 50 tracking stations, relay stations, research establishments and other government agencies. These include Minitrack station No 4 at Woomera, the other Minitrack stations throughout the world, Atlantic and Pacific missile ranges, the USAF National Space Surveillance Control Center at Bedford, Massachusetts, a special NASA tracking station in Heidelberg, Germany, and the Smithsonian Astrophysical Observatory at Cambridge, Massachusetts. Before the end of this year the new Minitrack station at Winkfield, near Windsor, will come into operation; and a direct teletype line to Manchester University radio astronomy station at Jodrell Bank was being connected at Goddard at the time of my visit.

As the tracking stations go into operation following a satellite launch, reports begin to flow in to the control centre at Goddard. This data is fed into a computer system which thereupon produces orbit predictions which are transmitted to the appropriate stations. As new tracking data comes in, the computers are continually bringing up to date the predicted orbits. In many cases "drive tapes" are produced which, when transmitted to a station, are fed into the control system of the station's directional antenna.

Several improvements in the flow of data through the control centre are being made with the move to the new building. These include a change from cards to magnetic tape as the input to the computer, and the ability to tie in one of the Goddard computers directly to a tracking station on request. Two new computers will be used "back to back" for Project Mercury and other work.

The balloon satellite Echo 1, with its exceptionally light weight and large area, provided the team at Goddard with one of their busiest periods during recent months. Apart from its communications application, the satellite was a valuable means of studying the characteristics of the space environment. Analysis of the tracking data showed that radiation pressure exerted by the sun was reducing the perigee of Echo 1 by some 3½ miles per day, quite apart from the effect of atmospheric drag. Total force exerted by the sunlight on the balloon, it was calculated, amounted to only one-fiftieth of an ounce.

The new aspects of Echo's orbit meant that longer periods of tracking were needed and, as there was nothing against which to check the observations, a new theory had to be worked out. The effect of the solar radiation pressure was found to be to change the orbit of Echo 1 from its initial circular shape to an elliptical one and, because in relation to the satellite's orbit this pressure is not always exerted in the same direction, to cause further periodic changes between circular and elliptical orbits.

Dr Peter Musen of Goddard's Theoretical Division was the man who developed the new theory used to calculate the solar pressure. The refined orbital characteristics of Echo 1 on which the solar radiation pressure and density studies were based were computed under the direction of Dr Joseph Siry.

At the time of my visit Courier 1B was the current object of attention. Teleprinters linked to the nearby computer section were steadily coughing forth, on yellow paper, closely typed rows of figures giving predicted orbital positions (at three-minute intervals) for the satellite. Across the full width of one wall was stripped a fourfold map of the world, on which black, red and green sine-waves (or so they appeared) indicated Courier's track over the Earth.

Looking forward to the increased business that is certainly coming, it seemed that the new control centre would need a bigger map—or a bigger wall.

KENNETH OWEN

In the payload systems division at Goddard Space Flight Center, the author is shown a mock-up of the S-6 atmospheric structures satellite by Mr Francis Le Doux of the mechanical systems branch

FLIGHT SYSTEM SURVEY

The Third Air Traffic Control Convention

THE third convention of the Guild of Air Traffic Control Officers was held in the Town Hall, Bournemouth, on Tuesday and Wednesday of last week. Seven papers were presented on a variety of subjects connected with ATC. There were two lunches and an evening reception; and the convention was concluded by a "brains trust" question and answer session. Bournemouth proved to be a pleasant meeting place and the convention was warmly welcomed by the Mayor of Bournemouth and directed by the Master of the Guild, Mr Arnold Field. The Clerk of the Guild, Mr L. S. Vass, was largely responsible for detailed organization. About 340 Guild members and guests attended and equipment displays were provided by Marconi, Standard Telephones & Cables, Cossor, Decca, Redifon, Thermionic Products, Amplivox and Airmed. Several representatives of overseas air traffic control officers' associations were also present.

Perhaps the main impression to be gained from the convention was that the men who exercise the control and those who design highly complex computer systems and radars for ATC have drawn much more closely together and now speak something like a common language. It seemed to be generally agreed that automation in traffic control centres would assist much more than displace human controllers, but that the introduction of such equipment must be an evolutionary process and not a sudden change-over. It is also an inescapable fact that the equipment which can effectively assist the controller can only be provided if those responsible make up their mind to lay out a very considerable sum of money; and the decision must be taken as soon as possible. The manufacturers can offer a very wide variety of equipment. It remains for somebody to take a firm decision and to initiate the move past the present experimental and proposal stage into the stage of operational evaluation if not actually of routine operational use. Any experience in using machinery is important.

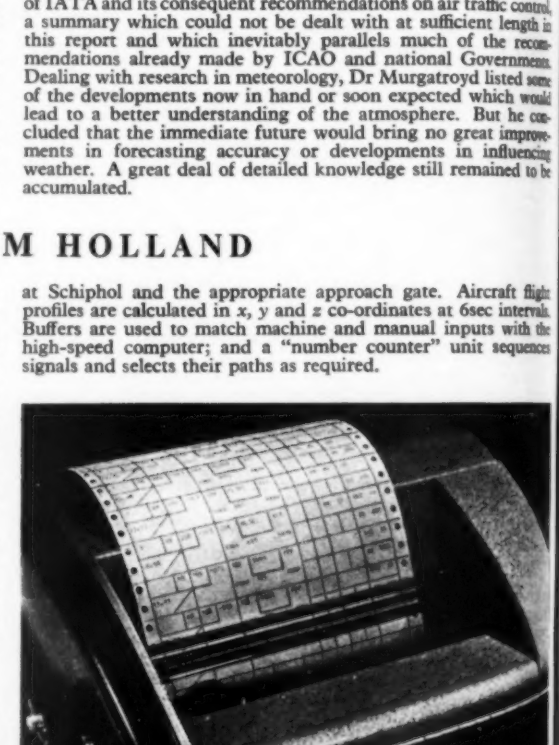
Not summarized in detail in this report of the convention are the paper *Policy Requirements of IATA Member Airlines in Relation to Air Traffic Control* (by Mr J. L. Gilmore, technical liaison officer of the European-African Region of IATA) and *Current Research in Meteorology* (by Dr R. J. Murgatroyd, Chief Meteorological Officer of the Meteorological Research Flight, RAE Farnborough). Mr Gilmore detailed at some length the functions of IATA and its consequent recommendations on air traffic control, a summary which could not be dealt with at sufficient length in this report and which inevitably parallels much of the recommendations already made by ICAO and national Governments. Dealing with research in meteorology, Dr Murgatroyd listed some of the developments now in hand or soon expected which would lead to a better understanding of the atmosphere. But he concluded that the immediate future would bring no great improvements in forecasting accuracy or developments in influencing weather. A great deal of detailed knowledge still remained to be accumulated.

SATCO FROM HOLLAND

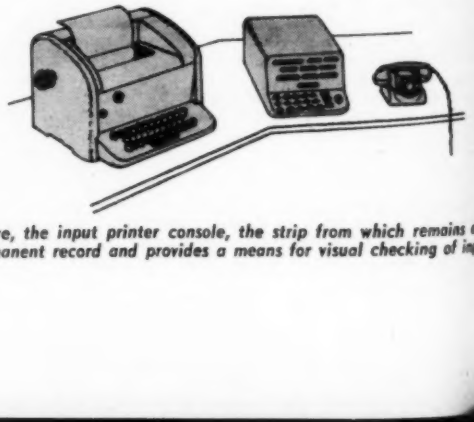
AN excellent 25-minute colour and sound film describing the operation of the SATCO automation system produced by Signaal Apparaten in Holland was introduced by Lord Glanusk, commercial manager of Mullard Equipment Ltd, who represent Signaal in Britain. Phase 1 of SATCO was described by Signaal engineers, rather modestly, as a "nice strip-making machine." It consists of a central computer in the memory drum of which the let-down and climb performance of selected types of aircraft are stored. Flight plan information is then received in the centre and entered into the computer in simple letter and figure codes by a tele-type operator. Using this information, the computer almost instantaneously produces a complete batch of flight progress strips giving the forcast times, heights and groundspeeds of a particular aircraft at each reporting point.

The flight strips are then manually loaded into holders and positioned on a standard control rack and human control is then exercised in the normal way. A wind input unit produces two parallel paper tapes (for self-checking) on which winds over Holland are punched for four areas and ten height bands. This wind information is used to compute the actual flight profiles of descending and climbing aircraft and to select the duty runway at Schiphol and the appropriate approach gate. Aircraft flight profiles are calculated in x, y and z co-ordinates at 6sec intervals. Buffers are used to match machine and manual inputs with the high-speed computer; and a "number counter" unit sequences signals and selects their paths as required.

Below, a bank of the electro-mechanical indicators which will replace printed flight progress strips in the Phase 2 SATCO system to be installed at Schiphol in 1962. The lights on the left will show conflicts or failures. Several thousand indicators will be required in each centre



Above, automatic print-out of flight progress strips in the Phase 1 system. There are two printers, one using blue and the other yellow paper according to whether the aircraft are east- or west-bound



Above, the input printer console, the strip from which remains as a permanent record and provides a means for visual checking of input

Two printers produce flight progress strips in blue or yellow for east-bound or west-bound aircraft. Any deviation from predicted performance can be inserted by the controller into the computer by keyboard and a new batch of flight progress strips is immediately printed. A permanent record is provided by the paper strip from the input printer, which also provides a means of visually checking the computer inputs. The film and its commentary clearly showed how all these processes were performed at Schiphol. Copies are available in a number of languages.

Phase 2 of SATCO mainly provides for automatic conflict search and the display of flight progress strip information by electro-mechanical indicators instead of conventional printed paper strips. Radar inputs would also be possible, so that aircraft could be identified and tracked and flight information up-dated much more often than with position-reporting. Automatic tracking radars and air-to-ground data links could also be added to provide even more direct surveillance of flight paths and closer control. Some time after the introduction of Phase 2, conflict search and warning would be supplemented by conflict resolution, which would compute avoidance procedures.

A Signaal engineer foresaw the use of radar displays on which a computed position and identification of an aircraft would be displayed together with actual radar returns. The operator could then position a symbol over the actual aircraft echo, press a button and thereby insert a correction to the computer if necessary.

The audience very soon raised the question of reversion to manual operation in case of failure and the Signaal engineer stated that a quarter of the elements in the present SATCO computer were intended for checking and had no calculating function. Two-channel computation would also be employed, so that if one channel failed a second would continue working, though overall capacity would be reduced. Console failure could be allowed for by provision of a second console with a manual changeover switch.

Altogether 14 ways of displaying letters and figures from the computer had been investigated and the present electro-mechanical system did ensure that the last "good" indications would remain in view after display failure so that the complete situation picture would remain and only the up-dating function be lost. The degree of redundancy to be provided in a system of this kind was, according to Signaal, a difficult problem and one which was dictated mainly by economic considerations.

RADAR IN AIR TRAFFIC CONTROL

THE Guild's own paper, entitled *The Application of Radar to Air Traffic Control*, was prepared by a group of members and read by Sqn Ldr K. B. Crosbie, a member of the RAF United Kingdom Air Traffic Service. The paper considered the present situation over the United Kingdom under the three main headings of civil operations, military operations and the limitations of the radar system itself. Civil and military operations were carried out in accordance with different rules and with very different operational requirements. The civil operator wanted established and protected routes for pre-planned operations, but the military commander required a large element of tactical freedom with the minimum of pre-planning.

The conflict was not only civil/military, but also military/military. The latter problem could be overcome by centralizing control. Groups of adjacent airfields were in fact already being controlled as complexes. But a common controlling medium was required to overcome civil/military conflict and the Guild considered that the only known common factor for the foreseeable future was radar.

Sqn Ldr Crosbie noted that there were at present some 300 radars in the United Kingdom, almost half of which had ranges of more than 50 miles and height coverage of 15,000ft or more. Radar coverage was one thing, but utilizing it for aircraft control was another. In addition, there were probably between 300 and 400 aircraft airborne over South-East England at any one time, with horizontal and vertical performances varying from 120kt to 600kt and from 300ft/min to 3,000ft/min. The fact that most British airways were two-directional meant that a radar controller would have to resolve a built-in collision hazard before he could perform his main task of controlling climb and descent through occupied levels. The pattern was in fact twofold. First, radar control had to be used in support of a planned procedural system, later also employing a precise navigation aid; secondly air space outside the route system required radar as the prime controlling agent.

The Guild suggested accordingly that both civil and military radar controllers required radar cover between 5,000ft and 25,000ft, backed up where necessary by airfield radars. Universal coverage of the UK was then required from 25,000ft to over 60,000ft, to be used in combined civil and military centres.

Based on this assessment, the Guild's proposal visualized radars specifically designed and sited for traffic control; they specified a Type 1 radar with 150 n.m. and 5,000 to 25,000ft cover, while Type 2 should cover from 15,000ft to 60,000ft with a positive range of 250 n.m.

Both types should satisfy a number of requirements. They should be designed for 24hr operation with sufficient redundancy for routine maintenance and radar or power failure. Echoes from weather and ground features should be eliminated, but weather returns should be available to allow vectoring round storms. External interference should be eliminated, and to this end a central licensing authority should be established to ensure that new radars did not cause interference with radars already operating nearby.

Tangential and blind velocity fades should be eliminated from MTI systems. The aerial should turn at not less than 10 r.p.m. Much research was necessary to assist controllers in directing avoiding action for high-speed aircraft. The minimum beam width should be 2° in order to provide a sufficiently large radar return on the screen, and the penalty of reduced discrimination would have to be accepted. This stipulation was made in relation to currently available radar and did not take into account synthetic display-brightening methods. Coverage in the operational area should be absolutely gap-free.

Automatic height-extraction should be provided, not so much in order to indicate the height of each aircraft as to make it possible to select given height bands for display. A choice of video maps should be available to assist procedural guidance. Automatic identification, which pre-supposed the use of secondary radar, was desirable, but international agreement was obviously required to cover the airborne equipment. It should be possible to transfer identified radar information automatically from one controller to another. Radar consoles should be unit constructed and the controller should be able to select his aerial head; console controls would require special study.

This specification implied no criticism of manufacturers, but was intended as a guide for equipment directly designed for ATC work. The aerials should be sited to provide suitable coverage and the radar information remoted to centres which were junction points for ATC communications and where radar information could be matched against all other relevant information. Type 1 radars should therefore be provided in the civil/military centres at London, Preston and Prestwick and military airways-penetration could be controlled from these points. Spare coverage could be used for military operations. In addition, three military radar areas should cover the Vale of York, North-East England, South-East Scotland, East Anglia and South and South-West England. Type 2 radar information need only be remoted to two of the combined air traffic centres. On this radar framework a system compatible with present and future civil and military operations should be built up.

Finally, the Guild stated that any automation or computers introduced into the control organization must leave the human controller as the main "thinking machine."

THE SEVEN SINS OF INTERNATIONAL ATC

SPEAKING, as he pointed out, in a private capacity, Capt Lincoln Lee of BOAC delivered an incisive and amusing indictment of seven "sins" which he had noticed during many years of operation on almost every BOAC route. The sins were poor organization and equipment, non standardization, bad timing, poor nomenclature, waste, poor discipline and mistakes. Capt Lee pointed out that he was not an ATC expert but a pilot and that despite the "seven sins" he had great respect for the work done by controllers. Neither were his remarks directed at any one country or any one place. The examples he gave of the seven sins are briefly summarized below.

No 1 Sin: Poor organization and equipment. All too often, point-to-point communication was non-existent or broke down, so that air-to-ground radio frequencies were at times choked with point-to-point messages. Sometimes the facilities were simply not used so that a centre was surprised at the arrival in its area of a particular aircraft. Capt Lee cited several cases of lack of co-ordination between centres and approach controls and of indecision about which frequency was to be used for a given control phase. Lengthy and complex flight clearances often tied up R/T channels unnecessarily and a series of pre-set routes with code names might replace *ad hoc* clearances. Routes without facilities, unreliable facilities and over-optimistic use of radar were also snags.

No 2 Sin: Non-standardization. In this category Capt Lee put upper-air quadrantal levels still not generally agreed; metres

FLIGHT SYSTEM SURVEY . . .

instead of feet used for vertical separation; non-standard radar vector terminology; continued use in some areas of QNH for vertical separation at high levels; different estimations of transition levels; and non-quadrantal cruising levels in ADRs. He nevertheless paid tribute to ICAO for the "tremendous degree of standardization which it has achieved."

No 3 Sin: Bad timing or unpreparedness. This was a lesser sin, causing irritation rather than danger. Examples were the interruption of starting-up procedures by clearance messages, the passing of ineffectual weather information, delay or failure to provide onward clearance, and confusing instructions about holding or passing flight levels.

Short-term clearances could unnecessarily interfere with descents. For example, a pilot might be cleared to "descend to Flight Level 200 and report." When passing through 210 he would call "Approaching 200, request further descent clearance." He might be told "Report at 200." He levels out, brings in the airbrakes, opens up the engines and reports "200." The immediate reply might be "descend to 160." Back come the throttles, down goes the nose, out go the brakes and less than two minutes later the passengers are once more regretting their over-indulgence. Such sequences were not always justified.

No 4 Sin: Poor nomenclature. This concerned mainly poor R/T phraseology. Messages such as "line-up and hold" and "line-up and go" could be misunderstood. Numbered call-signs could often be confused, for example, Aircraft 201 descending to flight level 205 and, simultaneously, Aircraft 205 climbing to 225. Capt Lee preferred "yes" and "no" to "affirmative" and "negative" and felt that "wilco" was more effective in appropriate circumstances than just "roger."

No 5 Sin: Waste. This was really self-explanatory and concerned unnecessary procedure or R/T conversation. Let-down procedures were sometimes wastefully elaborate, and printed airfield information such as the traditional "exercise care in landing till further notice" was liable to mask important information.

No 6 Sin: Poor discipline. R/T indiscretions such as the passing of personal messages and rudeness should be suppressed. Another difficulty was the exact meaning of similar white lines on runways and aprons at different airports. For example, a white line across the runway might mean "this is a displaced landing threshold" or "this is a displaced landing and take-off threshold" or "this used to be a threshold before we laid another 1,000ft of concrete, but the constructional science which enabled us to lengthen the runway has not yet devised a method of eradicating old white lines."

No 7 Sin: Making mistakes. Capt Lee said he had recently seen in a very important control centre the following notice, "In this centre we have a great incentive programme. One mistake and you're fired." He also recalled an occasion when, taking off at night from a certain airfield, he had been told to turn right after take-off. Fortunately he knew the place well enough to know that such a turn would take him straight towards a 12,000ft-high ridge and he therefore answered "Surely you mean left." The reply was a disinterested "Use your discretion."

Recalling some other mistakes he had experienced, he said he did not expect controllers never to make mistakes; but he did appeal to them never to be ruffled if a pilot queried an instruction.

Had he been listing virtues, concluded Capt Lee, he could have said twice as much. He knew what air traffic control could do for him as a pilot and he paid tribute to foreign controllers who spoke the international language of the air, English, remarkably well. When one remembered that about five per cent of the world's merchant shipping was damaged in collisions every year one realized how good ATC was in "preventing, in most cases, any collisions at all." But he wanted to see more positive control and thought there should be a world ATC authority with power to refuse unsuitable aircraft permission to enter zones; to take control of aircraft on VFR flight-plans; and to dictate in terminal areas what groundspeed aircraft should fly. The last-named would be practicable with Doppler.

Finally, Capt Lee said that both pilots and controllers now held each other in considerable respect and he noted the pleasant affectation, commonly heard on the world's airways, when both pilot and controller on first making contact called each other "sir."

COMMUNICATIONS SATELLITES IN TRAFFIC CONTROL

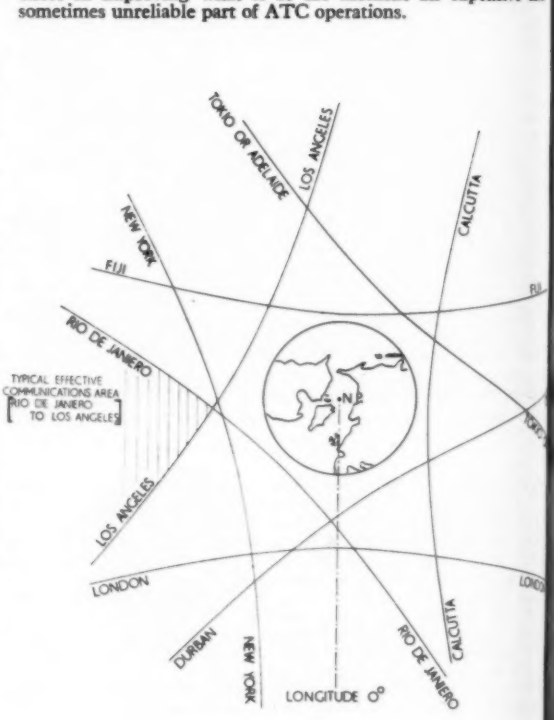
THE possible application of satellites to point-to-point communications which might be of use in air traffic control was discussed by Dr W. F. Hilton, head of the Advanced Projects Group of Hawker Siddeley Aviation. He pointed out that neither the US nor Russia was likely to develop a communications system of this kind for world-wide use, because they were each too preoccupied with their national requirements. It was, therefore, up to Britain with its special need for world-wide communications to provide the service.

Dr Hilton began by saying that there was more to space than scientific investigation and that enough was now known to make use of inner space up to two or three Earth's diameters from the earth. Pye and Hawker Siddeley had developed Moon-bounce equipment, but the 2sec travel time of signals and the transmission powers required meant that special techniques would have to be employed if Moon bounce was to be used for routine communications. An orbit at about one Earth's diameter seemed to provide a reasonable compromise between power and range, and his group had designed an active communications satellite weighing about 700lb (*Flight* for September 9) which could be launched by a Blue Streak with a Black Knight second stage and a third stage. Three such satellites could be launched into elliptical orbits with 63° inclination to the equator and apogee and perigee of respectively 12,600 miles and 300 miles. Between 60 and 70 per cent of the orbit time would be useful for communications and the orbit would be easier to achieve than either a circular one or the 24hr orbit providing an effectively stationary satellite.

Some £25m was at present sunk in Atlantic cables in a scheme which had cost a total of £83m. Conversations cost £1 a minute at peak times and rather less at off-peak times. By contrast, Blue Streak had cost £65m up to the time of its cancellation and the satellite system could be economically operated if each satellite lasted for one year. But it was reasonable to expect each satellite to last 20 years and message costs could accordingly be reduced to 1s a minute. The orbits would be so distributed that full cover would be provided at appropriate times of day between any two major points on the Earth and that the same satellite would be in position to provide communications between other points during the off-peak times for the first points. The satellites were therefore equivalent to a whole network of under-sea cables, and the capacity of each link would be economically employed.

Three satellites, each completing 4¼ orbits per day, would for example provide communications at London between 8 a.m. and 6 p.m. and serve other cities during appropriate daylight hours. The 4¼ orbits per day could compensate for the seasonal changes in relative position of the sun.

Such a satellite communications system obviously has applications far wider than that of air traffic control point-to-point messages, but it might very well at a later date have a significant effect in improving what is at the moment an expensive and sometimes unreliable part of ATC operations.



The apparent horizons for various locations in relation to communication satellite orbits. The shaded area on the left shows the typical effective communications area which can be derived from these horizons

AMERICAN EXPERIMENTAL EQUIPMENT

THE most significant factor which emerged from a paper on American ATC research and development by Mr C. E. Dowling, a member of the FAA mission to MoA, was that the American process of "learning by expense"—a definition produced by another speaker—had already given American controllers invaluable experience in actually using advanced equipment of the type which will form the basis of the new automatic centres. One of the main problems was, after all, to introduce the men on the centre floor to complex machinery and to give them confidence and skill in its operation. The same problem existed in introducing airline crews to such manœuvres as automatic landing.

Mr Dowling first mentioned a number of projects which were now under way in the US. One was the 300-IR communications control unit, in which interphone channels could be selected by button on a small console and incoming messages could be stored and read out in sequence at leisure. The first unit to be made was compatible with the Data Processing Central and was to be evaluated at the FAA experimental establishment called NAFEC.

A contract was now being negotiated for a wireless microphone, head-set and channel selection device which would allow controllers to move about the centre without trailing a long lead behind them. The lead would be replaced by a short-range, transistorized radio. One version would be worn, the other hand-held. Full duplex operation would allow side-tone and reception during transmission.

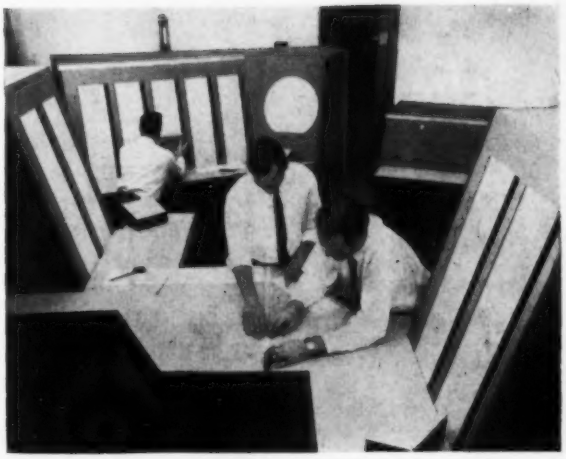
Mr Dowling gave details of a VHF or UHF data link system on which pre-set messages could be exchanged between ground and aircraft at the rate of 500 two-way messages in two minutes. Airborne and ground indicators were illustrated. Voice override for non-routine messages was provided and a tape print-out would be provided in the aircraft for selected or special messages.

Also undergoing initial tests at NAFEC was the Air Height Surveillance Radar, a passive radar detecting the height of targets illuminated by S-band airfield radar. The AHSR aerial was 160ft high and stationary. It had three faces each covering 120° of azimuth. Each face developed 111 beams in the vertical plane, the uppermost being elevated at 40° to the horizon and having a vertical resolution of 0.5°. The lower beams had 0.2° resolution. A ten-beam element was initially being evaluated. AHSR data might be used to height-code aircraft returns or to allow height sector displays. Target height might be displayed in an outer ring surrounding a normal plan-position display.

Most significant was the use of industrial computers in ATC centres. First an IBM 650 with an additional RAMAC Disk Storage Device and buffer were used at Indianapolis and then a Remington Rand Univac File 1 was installed at NAFEC. Six such computers were now used to receive and store flight plans, compute ETAs at reporting points and destinations, print out flight progress strips and to transmit flight-plan information to other centres. For computation purposes, the Indianapolis area was divided into a grid. Flight plans were fed into the computer by tape printers and a stored tape loop. Flight plans could be directly transferred between computers in neighbouring centres. Flight progress strips were printed out in two type sizes and two colours. The computers not only relieved controllers of a good deal of clerical work, but gave them invaluable experience of programming and the operation of computers.

Another system was the IBM Cardatype, where well-known route fixes and designators were stored on punched cards and combined with aircraft information inserted by manual keyboard.

Flight Data Entry Equipment (FLIDEN) was now being tested. It consisted of a keyboard and electronic display tube on which the operator could select a message format and then type out a message or flight plan for display. He could compose and check the whole message on the tube-face and then press a button to transmit the message at 600 words per minute into the computer or at 75 or 100 words per minute on a teletype line. The message was transmitted complete with functional codes and error checking characters. Also being evaluated for input purposes was the Teletype Model 28 Programmatic machine, a synchrotape unit with a punched-tape loop intended for use in remote locations with teletype lines. High-speed line printers were being developed to print 8,000 progress strips per hour.



Preparation of a radar console for two operators which will form one of the many items in the Data Processing Central now being produced by General Precision Laboratories in the US

In order to facilitate the handling of progress strips, a machine was being tested which could load 40 strip holders per minute. A single-direction conveyor-belt system had been installed and was still used at Indianapolis to convey strip holders from the printing position to the progress boards. More units would be ordered for other centres as soon as tests were completed on a two-directional system now being installed at San Antonio.

A real-time clock had been added to the computer at NAFEC to signal one-minute time intervals to the computer storage and to trigger the passing of messages to neighbouring centres at pre-determined times. A corollary of this was a device which allowed the controller to select to receive messages at pre-selected times.

Several storage-file drums, each with a capacity of 180,000 characters, were needed for each computer; and, as programmes were extended, calculation times increased. The time factor in this instance presented the next limitation in system capacity.

Mr Dowling went on to describe certain features of the Phase 2 Data Processing Central with its radar inputs and bright tube displays. The Phase 2 programme has, incidentally, been somewhat delayed and it has now been decided that a "Phase 1½" system will be installed at Boston and become operational before the true Phase 2 system goes into service at New York. In the meantime, basic DPC modules have been delivered to NAFEC and are being evaluated.

Mr Dowling said that a most important part of the development programme was the use of simulators, because this was the only way to introduce the human controllers into the tests and to give controllers and designers alike a realistic idea of the problems. Now operating at NAFEC was a Type A 50-target simulator for a 200 square mile area with associated communications and data collection and reduction system. Live radar could be mixed with the synthetic picture. The later Type B simulator would have 60 targets and a 400 sq ml area and would also include fully coded beacon capability, magnetic tape data recording and problem play-back on a Charactron display. The simulators were also used in developing improvements for actual high-density areas by inserting traffic samples representative of actual and future conditions. Personnel from the areas under test could participate in the simulation in order to produce a constructive solution.

Dynamic simulation was also being applied to the study of improved approach sequencing and there were many other problems which were being studied at NAFEC.

Computer Publications Summarized

EACH month the Technical Information Co, Chancery House, Chancery Lane, London W2, issues *Computer Abstracts* which gather together references from scientific, technical and business publications and patent reviews from all over the world. More than 5,000 references, 600 publications and 8,500 international patents are annotated and indexed for immediate scanning or reference and a monthly news sheet called *Computer News* is added to give more general news. There is also a document procurement service. The annual subscription for *Computer Abstracts*, including *Computer News*, is £25 4s.

Aviation Cartography

THE Library of Congress has now issued the second edition of *Aviation Cartography, a Historico-Bibliographic Study of Aeronautical Charts*, by Walter W. Ristow. The purpose of this work is to summarize the history of aeronautical chart-making from its earliest days, mainly by a comprehensive international bibliography which occupies 188 out of a total of 245 pages. There are nearly twice as many references in the new edition as in the first, which was published in 1956, and most of the additional works have appeared since that date. Copies may be obtained from the Card Division, Library of Congress, Washington 25, DC. Cost is $1.75.

PIA Profile

An Assessment of Pakistan's Airline: Part 2—Above the Snowline

Story and "Flight" photographs by
ALASTAIR PUGH

THE freight run from Rawalpindi to the Kashmir towns of Gilgit and Skardu is probably one of the most exciting regular civil air operations in the world. Although the journey time by DC-3 takes less than an hour and a half, it is never flown at less than ten thousand feet. Even then, on either side of the aircraft the mountains tower up 10,000, 12,000, even 16,000ft to the lofty summit of Nanga Parbat, and drop 6,000ft below into the valleys of the Indus. Here, a member of "Flight's" staff who has recently visited Pakistan recounts his impressions of the route among the snows of the Karakorum range west of the Himalayas.

THE flight to Gilgit has something in common with those mouth-drying, palm-moistening runs on a funfair big-dipper. With mounting tension you are hauled up quite slowly to the release point, plunge wildly down and around a series of swerves and inclines and finally—all energy spent—roll quietly down the final slope to the finish.

* * *

It is hot at Rawalpindi in the morning; by ten o'clock the temperature is pushing up past the 80s, and as our DC-3 lifts off, turns north and heads, climbing hard, straight for the hills, it bumps and rocks in the shimmering heat rising from the dry, red-brown earth of the plain. Almost immediately we are scraping across the first scrub-covered foothills, barely three hundred feet below, but as we clear them there is another higher ridge ahead, and then another, and another until they are hills no longer, but fade mistily into the distant peaks of apparently limitless mountains.

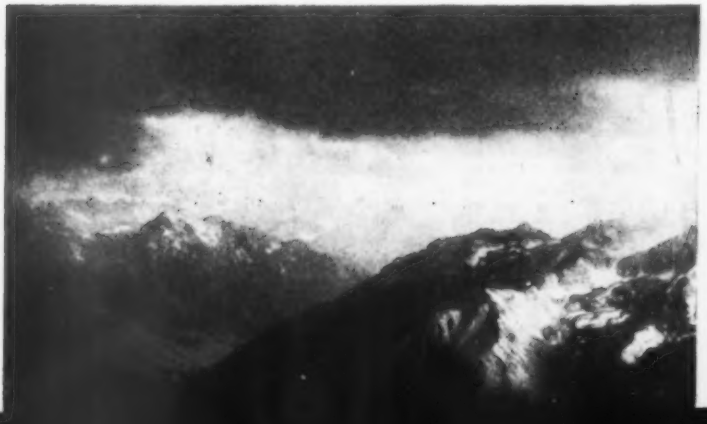
You get nearly 6,200lb of payload with a DC-3 at 28°C and a take-off weight of 26,900lb: perhaps half a dozen passengers and a cargo of commodities essential for survival in the bleak Kashmiri winter—wheat and rice, fuel for the jeeps, kerosine for the lamps, precious salt, and ammunition for the army. Under the tie-down netting in our aircraft are painstakingly decorated tin trunks (do they belong to the two Moslem ladies in purdah, who sit so demurely in their double seat?), mysterious bundles wrapped in the rough, dyed Kashmir tweed, and coarse brown sacks in which PIA delivers these high-flying groceries for the Ministry of Kashmir affairs. The passengers, not the freight, are the incidentals here. Though the aircraft are internally very clean, these DC-3s are very much freighters, and a fleet of five of them is committed to making nearly 1,000 mountain sorties through the high snows every year.

Almost absolute reliance for Gilgit and Skardu's supplies is placed on PIA's extended freight charter; the road—a jeep track impassable to two-wheel-drive vehicles—winds tenuously across the 14,000ft Bahusa pass and is snowed-in for all but a few short summer months each year. Even then, the journey takes an arduous, outdoor-living seven days compared to an hour and twenty minutes in the aircraft. PIA have been operating this service for nearly twelve years, and in all that time have had only one accident.

Going forward, I find Capt Baluch, a towel over his knees to protect his white uniform trousers from dusty stores, keeping 2,400 r.p.m., 31in, and the airspeed at 115kt. Below the nose the scrubby brown and green give way to fiercer, more precipitous shale-covered slopes and in the distance, over on the left, sunlight reflects briefly from the Indus, coiling snake-like in the valleys between the mountains. Correct airspeed is one of the safeguards of this operation. To make certain that the aircraft can get back if an engine fails, 10,500ft must be reached before we join the Indus valley. From our interception point we follow it in a long curve east, northeast and then north towards Gilgit. Climbing up at about 400-500ft/min on a northerly heading, the first of several timed and visual check points is reached when a loop in the Indus first crosses our track. From here on, we fly on timed legs and compass headings, for the mountains and valleys have a deceptive habit of changing their appearance from one hour to the next, and a premature turn with a loaded aircraft into the wrong valley can end in only one way—no room to turn, no chance of climbing and the mountain walls remorselessly closing in.

At the operating height Capt Baluch throttles to 2,000 r.p.m.

Most of these cockpit-eye photographs of the Gilgit operation were taken from heights of 10,000-16,000ft above ground level, the two exceptions being the approach to the shingle-covered runway (opposite) and the far picture on the right, above, which was taken shortly after taking off from Gilgit before turning back down the valley. To the right of the runway is a new tarmac strip which, opening next month, will next year be used by a PIA F.27 Freightship



and 21in, retrims, closes the cowling flaps and makes his decision whether to join the Indus valley or to turn back to base. Only if the route is strictly VMC may he continue, and the minimum cloud height for pressing on is 9,500ft. Today, fortunately, cumulus cloud streets are forming at about 11,500ft and we continue north to Jalkot, from where we shall follow the grey-blue waters of the Indus, 6,000ft below. Craggy rocks now stretch upwards either side of us, bearing in oppressively on the aircraft's red-painted wing tips, and razor-sharp spines slide breathtakingly closely beneath. Looking forward through the screen, each time it seems that, unless the nose is lifted, we shall never clear the next spur, and I marvel at the steady, undramatic flying of the PIA pilot, who drifts the DC-3 along just comfortably clear of each successive ridge. He points out an alternative route for getting home, minimum altitude 19,000ft.

From Jalkot we turn a few degrees right again and head towards point "B," ten minutes' flying time exactly from Jalkot. The peaks on either side now reach jaggedly and cruelly upwards to 16,000ft. One in particular, a bare, uncrevassed wall of unyielding rock, stands *in perpetuum* as a cloud-wreathed memorial to the crew who lost their lives a few years ago.

If one were needed, this mountain wall is a grim reminder that on this route there is no room for taking chances with the mountain weather. It is said that the pilot slipped out from Gilgit as mist began to drift in over the top of the valley, and that as he followed the Indus home to Rawalpindi the clouds ahead closed in. He turned back, but soon there was cloud ahead of him again. No VHF radio telephony is possible in the mountains, but the subsequent short, grim history of that ill-fated flight was dutifully transmitted on W/T by the radio officer who is a member of every crew. There was a slender chance that if the DC-3 could have reached its ceiling of about 21,000ft it could have cleared the mountains and headed south for the plains. Blind, and flying tight circles, the pilot climbed up through the valley in cloud but struck the top of the peak before he broke clear.

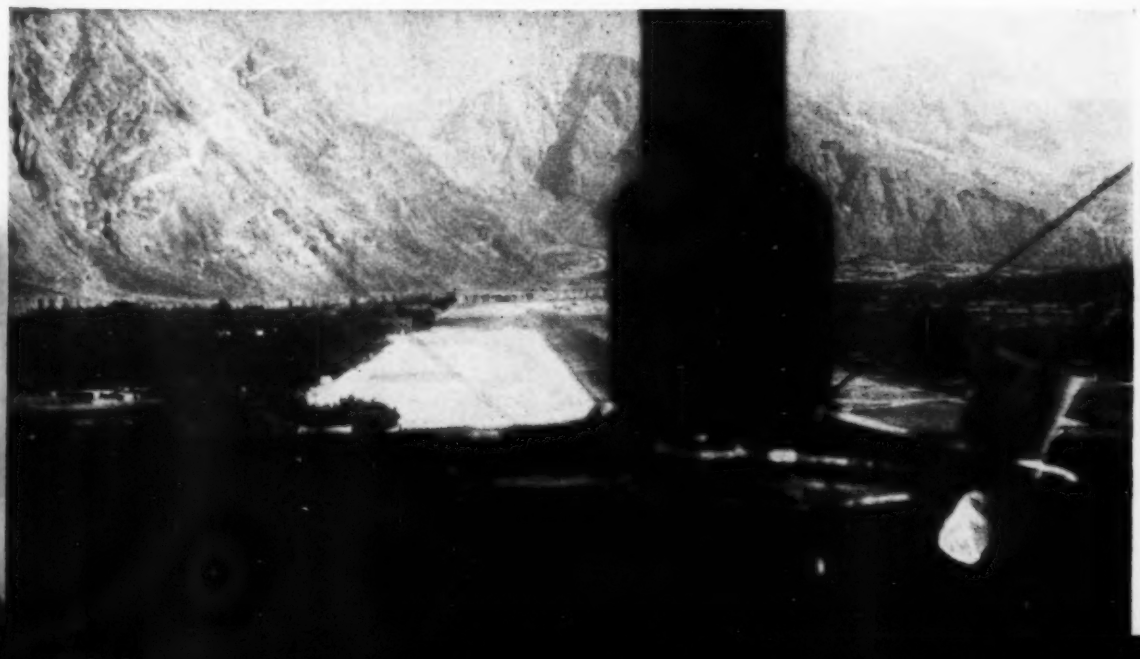
Shaken by this story, recounted across the cockpit above the reassuring roar of the DC-3's R-1830s, I am relieved that the valley ahead of us is opening out and that above it the sky is a clear summer blue.

As we turn a corner in the valley, suddenly, astonishingly, ahead rises Nanga Parbat—the Naked Mountain—its lofty peak alone in the cold, bleak snows. From 10,000ft we crane our necks to see it as it stretches impossibly high above us to 26,660ft. As we draw abreast of its lower slopes we are passed by the PIA DC-3 returning from the first sortie of the day, twinkling in the sun high above us, heading out over the direct route home at 16,000ft. The sky which a moment ago appeared so blue is now rapidly clouding, and Nanga Parbat becomes cloaked again in the ambient mystery of her enshrouding clouds. We have now been flying for one hour and twelve minutes, and from our Olympian heights we throttle back and start the let down at a steady 600ft/min. Ahead now lies a distinctive Y junction of rivers and valleys. To the right the brown Indus flows down between steeply sloping mountain walls from Skardu. To the left the blue Gilgit River adds its glacial waters to the Indus. This marks our route to the airfield, and as we approach the junction at 7,000ft we branch up the valley and call the little airfield on our VHF.

Again comes the simile of the big dipper: we have left the snows behind and are dropping down now over a valley where cultivated patches of green are dotted about in the brown sandy shale. Capt Baluch circles the town for me and points out the polo field, remarking that it was in the Gilgit Agency that the game was invented. We turn comfortably within the confines of the valley walls, drop flaps and wheels, slide over a ridge and descend steeply to wheel on under power on to the shale surface of the Gilgit runway.

Next month a new metalled strip is to be opened and this will be used next year by an F.27 Freightship which PIA is introducing on this run. Apart from the many advantages which the

(*Concluded on page 684*)



BOAC: Ten 707-436, five more on order

TWA: Fifteen 707-131, twelve 707-331

Braniff: Five 707-227, three 720 on order

USAF (MATS): Three VC-137A

United: Ten 720, nineteen more on order

Pan American: Six 707-121, twenty-three 707-321 and three more on order

9,000 TONS OF BOEING

ON WEDNESDAY of this week, October 26, the Boeing 707 jet airliner had been in passenger service for exactly two years. It was first introduced on October 26, 1958, by Pan American. Since the initial 707 delivery by Boeing's Transport Division factory at Renton in September 1958, more than 160 707s and 720s have been built for, and put into service by, nineteen operators. Of these, sixteen (fifteen airlines plus the US Military Air Transport Service) have bought the aircraft, while three have leased them (Northeast from TWA, Western from Boeing, PIA from PanAm). Another ninety Boeing 707s have still to roll off the line at Renton according to the present order-book, which stands at 250 aircraft sold. These further ninety

Western: Two 707-139 on lease, four 720B on order

Qantas: Seven 707-138, three 138B on order

Sabena: Five 707-329

JETS DELIVERED

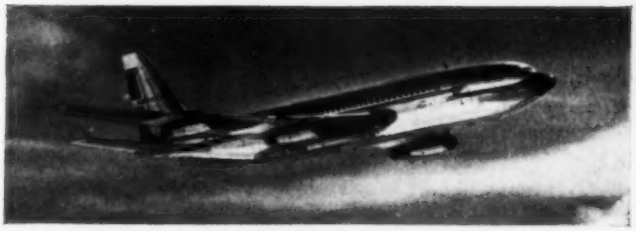
-orders for airlines already having 707s or for first deliv-ing: Avianca, two 720B; Eastern, fifteen 720; El Al, two n, two 720B; and Irish, three 720. Altogether, therefore, y-one Boeing 707 customer-airlines, plus MATS. At a ettimate, about 9,000 tons (basic weight) of Boeing 707 ow been produced. For comparison, this equals seven n of 280-odd DC-6Bs. Boeing are confident that they family orders and repeat orders for many years to come. not shown, the Parkistan International 707-321 leased rates in PIA colours

Lufthansa: Three 707-430, two more and four 720B on order

Air-India: Three 707-437, one more on order

Air France: Fifteen 707-328, two more on order

Varig: Two 707-441



American: Twenty-five 707-123, seven 720: one 707-120B, three more 720 and fifteen 720B on order

Continental: Five 707-124

South African Airways: Three 707-344

Light Aircraft in South America

By D. HYDE, MSc(Eng), DIC, ACGI, I. S. GARTSHORE, MSc(Eng), DIC, BASc. and W. H. MELBOURNE, PhD, DIC, BE

This article is the second of two describing the aeronautical aspects of the Imperial College Africa and Americas Expedition; the first "Light Aircraft in Africa," appeared in "Flight" of August 19 last. The expedition arrived in South America from Africa in Mid-July and covered 8,500 miles overland investigating civil light aircraft activities within the continent.

By submitting the plan for this survey, Mr Hyde won the 1959 John de Havilland Award administered by the Society of British Aircraft Constructors. The three-member expedition of former aeronautical students from the Imperial College (University of London) was sponsored by the Imperial College Exploration Board.

THE topography of South America is made up of jungles, swamps and vast plains in the east, cut off from the narrow western coastal strip by the Andean chain of mountains stretching 4,400 miles from the Caribbean Sea to the far south at an average height of 13,000ft. Such natural barriers, combined with surface communications that are inadequate and primitive (or in many areas non-existent), present ideal opportunities for the successful operation of aircraft.

In the republics investigated—namely, Brazil, Uruguay, Argentina, Chile, Bolivia, Peru, Ecuador and Colombia—over 70 people were consulted, representing directorates of civil aviation; air-taxi and non-scheduled companies; domestic airlines; agricultural organizations; and private interests.

Brazil, whose area is greater than that of the continental United States, contains approximately half the population of South America. Aero Clubs and private aviation are thriving, over 2,500 aircraft being currently registered in the latter category alone.

Operators of air-taxis, or *taxi-aereos* as they are known, are classed as those having equipment with not more than six seats or 600kg capacity; they are free to fly scheduled services and to fix their own tariffs, but flying is limited to VFR conditions. Where more than two aircraft are operated, a registered company must be formed: some 300 aircraft are used as *taxi-aereos,* 78 of which are owned by 15 companies.

Non-scheduled operations using equipment larger than that in the air-taxi class are discouraged in order to protect the interests of the regular airlines, which are subsidized both directly and indirectly by the government. Only two minor airlines are not members of one of the six major consortia into which the scheduled airlines are grouped. The non-scheduled companies must use multi-engined aircraft and have good maintenance facilities, and cannot "fly repeatedly between points served by the regular airlines" or "charge so that competition is made with regular airlines." Consequently only three organizations have non-scheduled licences and only one of these is operational.

It is interesting to note that of the 292 aircraft in service with the scheduled companies, no fewer than 173 are C-46s, C-47s and DC-3s; these provide almost half of the total seating capacity available. Re-equipment is a major problem to these airlines, whose domestic fare structures are falsely low. Extended-credit terms of up to eight years, which British manufacturers have great difficulty in offering, are necessary if new aircraft are to be bought.

Uruguay is the smallest of the South American republics, and here light aircraft and aviation fuel could be obtained at preferential rates of exchange until early this year; thus aircraft effectively cost one-fifth of their real price and fuel was reduced to one-third of its actual cost. Even today, with a free rate of exchange but with high automobile taxes, $12,000 buys a Cessna 180 or a new American car. This very high taxation on motor vehicles makes the light aeroplane particularly attractive to many of the *estancia* or ranch owners—the note that "an airstrip is available" often appears in advertisements for cattle sales.

A government grant to the aero clubs was increased two years ago to nearly £6,000 and is distributed in proportion to the number of pilots trained in the previous year (in this system PPLs account for one point and commercial licences for two points). Of the total of 330 civil aircraft with current Cs of A in Uruguay, 63 belong to the clubs.

Although only 28 machines are at present licensed to carry out air-taxi work, many others enter this market illegally. Even the subsidized clubs do unofficial charter work, providing unfair competition for the established taxi firms.

Argentina, second largest in size and population of the South American countries, is made up of four distinctive regions: the Andes, the North, the Pampas and Patagonia. For many years plagues of grasshoppers attacked the rich pastures of the Pampas; now as many as 250 aircraft are used for agricultural work, mainly to counter this menace. Of the 800 private aircraft in the country, a large number are based on the ranches. The Harries family, owners of the largest *estancia* in Argentina, operate 22 single-engined machines over their two million acres of property.

In the Argentine, as in Brazil, the aero clubs are strong with some 130 clubs owning 500 aircraft. At present a heavy import tax is levied on light aircraft and to avoid this some owners are retaining American registrations. The 182 stands out as the most popular model in the Cessna range, whilst the majority of the Piper products are Super Cubs, owing to this model's suitability for agricultural work.

Attempts are being made in Argentina to construct light aircraft suited to the vast potential market that exists; the immediate advantage of such projects is the avoidance of the heavy taxes on imported aircraft. The Instituto Aerotecnico at Cordoba is producing the IA-46, a three-seat high-wing aircraft particularly useful for agricultural work; power is provided by a 150 h.p. Lycoming unit. In addition, the IA-35, a general purpose military twin, is still in production at Cordoba, where the Morane-Saulnier MS-760 Paris and the Beechcraft T-34 Mentor are under licence production.

A three-place Macchi MB-308, which uses a 90 h.p. Continental engine, is being built under licence by German Bianco SA at Buenos Aires, but the wooden construction in this aircraft is not popular. Aero Talleres Boero SRL have designed and built two Aero Boero 95s at Morteros in Cordoba province. Also powered by a 90 h.p. Continental unit, this high-wing monoplane has a wide speed-range and is said to be ideal for taxi, training and agricultural work as well as for aerobatic flying. It remains to be seen whether a licence for quantity production for this model will be granted, as the Aero Boero 95 would be in direct competition with the government sponsored IA-46.

Among taxi operations, those of Aerochaco and TAASA are particularly interesting. Aerochaco's two Beavers operate a "radial" system of routes mainly within 200 miles of Resistencia in the Chaco a great lowland in the north-east of Argentina covered with scrub forest and grassy savannah. The highest summer temperatures in South America have been recorded in the Argentine Chaco, and this, combined with the rugged terrain, poor airstrips and heavy winter rains, make the area ideal Beaver country.

TAASA—Taxis Aereos Argentinos SA—are operating two scheduled services, with intermediate stops, from Buenos Aires north to Concordia and Diamonte in the rough Entre Rios Province. The company has six Rapides, only three of which are in service at present; it is hoped that an increase in the same region to seven routes will employ all six aircraft. In the last year three pilots flew 4,500 passengers on TAASA's services. The eight-

Left, TAASA Rapide with "stone-proof" modifications. Right, rotary atomizers on a Piper P.18 for banana-spraying in Colombia

The Piper Pawnee is overcoming the bias in favour of high-wing aircraft that exists among Colombian pilots accustomed to the Super Cub

seat Series 3 Rapides have been extensively modified by the company, the most obvious point being the absence of the undercarriage cowlings. This modification, combined with a metal fuselage bottom, minimizes possible damage from stones on primitive airstrips. The replacement of the standard 40 ampere-hour battery by one of 180 ampere-hours' capacity facilitates continued operations from strips without any ground equipment. The venturi has been located on the undercarriage strut, in the propeller slipstream, VHF radio has been fitted and v.p. propellers are manually operated.

Chile is a 2,800-mile ribbon of land lying between the Andes and the Pacific, and for this reason efficient transportation has always been important. The air-mindednes of Chile, whose total population is only seven millions, is reflected by the existence of 55 clubs using 260 aircraft and of 132 privately owned aircraft. A substantial government subsidy is distributed to the clubs each year by the Federacion Aerea de Chile and is based, as in Uruguay, on the number of PPLs obtained in the previous twelve months.

A total of 90 aircraft are engaged in all types of commercial activities in Chile. With the bankruptcy of CINTA/ALA and Transa de Chile, only LADECO and the government airline LAN operate scheduled services. Several companies do non-scheduled and air-taxi work whilst agricultural operations are carried out by four or five units using some twelve Piper Super Cubs.

LADECO, Linea Aerea del Cobre, have a scheduled service between Santiago, Potrerillos, Antofagasta and Calama using two DC-3 "Super 94s." The Pratt and Whitney 1830-94 engines enable the aircraft to maintain height at 12,000ft on one engine when fully loaded, and the gross take-off weight is increased to 26,900lb. Nevertheless, substantial payload restrictions still have to be imposed at Potrerillos; located at 8,300ft this is the highest airfield in Chile and the 5,250ft runway has a 3½ per cent slope combined with difficult approaches.

Bolivia, where the vast Altiplano at 12,000ft contrasts with the eastern semi-tropical lowland is relatively backward in its aviation. A total of only 86 civil aircraft are currently registered. However, the Directorate of Civil Aviation formed a flying training school in 1956, and at Cochabamba 15 students are now undergoing instruction on six single-engined aircraft. La Paz airfield, at 13,358ft, is unsuitable for training purposes since it is in fact the highest commercial airfield in the world.

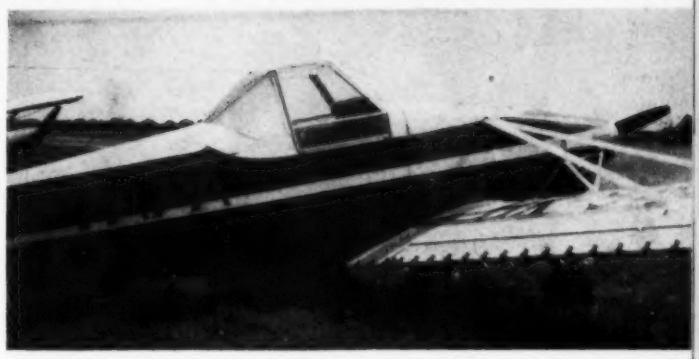
A lot of charter work emanates from the oil companies prospecting in the eastern lowlands; here Bristow Helicopters, Bermuda, have eight rotating-wing aircraft on permanent charter.

Most commercially operated machines are obsolete ex-USAF aircraft, B-17s and B-24s being common sights in Bolivia as well as the inevitable C-46s and C-47s. In such aircraft, beef has for many years been air-freighted from the Beni Province up to the Altiplano.

The Institute of Linguistics, based at Riberalta, on the River Beni, use a Piper Cruiser, an Aeronca floatplane and a Helio Courier. The Institute is a large international organization equipping and maintaining several hundred linguistic missionaries in isolated jungle areas. With headquarters at Glendale in California, this institution has South American operations in Peru and Ecuador as well as in Bolivia.

Peru has relatively little light aviation. A total of 60 aircraft are either privately owned or affiliated with one of the five aero clubs. However, the importance of cotton to Peru has accelerated the development of agricultural flying and cotton is now sprayed in the northern coastal regions and in the middle jungle belt. As many as 90 machines do this work during the season.

Only 22 aircraft are licensed to do taxi or non-scheduled charter work in Peru. One of the oldest-established firms is Aero Taxi SA, which was formed in 1953 by two Americans (the same two partners manage Jamison and Reich SA, the Cessna distributors for Peru since 1959). Seven war-surplus Cessna UC-78s were purchased for Aero Taxi in the United States and flown to Peru; now only two are flying, but a Cessna 180 was recently added to the fleet. Lima is used as a maintenance centre and the aircraft are based in the jungle at San Ramon, north-east of Lima. A network of seven HF radio stations is operated by the company, most of whose work has been the transportation of freight to isolated settlements in the central jungle region.



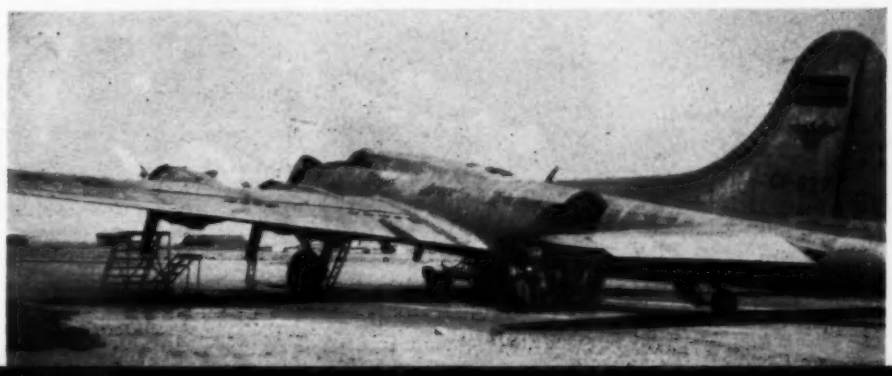
James Leaver, manager of the Colombian Piper distributors, with an Apache owned by the Department of Civil Aviation

The Faucett company, noted for its reliability and operational economy, has the distinction of being one of the few airlines to operate aircraft of its own manufacture. Thirty Faucett-Stinsons were produced around 1945, and four of these robust aircraft still remain in service. Each of the seven-passenger Stinson monoplanes is powered by a 600 h.p. Pratt and Whitney radial engine. The Talara - Tumbes and the Arequipa - Mollendo - Ilo routes are now flown by these four extraordinary machines.

Ecuador is the second smallest South American republic and, like Peru, has distinctive coastal, Andean and forested regions. Light aircraft activity is concentrated along the coastal strip, where most of Ecuador's resources are located. In this area nine agricultural companies use some 50 aircraft, mainly to spray the banana plantations. Eight Hiller UH-12s are now being used, in addition to a large number of the more common Piper Super Cubs. The one aero club in Ecuador is based on Guayaquil, on the coast, which is also the headquarters of the four air-taxi companies.

Regular services in the east are maintained by Transportes Aereos Orientales, who started operations in 1958; Quito is the maintenance depot and Shell-Mera, east of the Andes, is the jungle base. Twenty-two centres in the Oriente are served by TAO, eleven by a Junkers Ju52/3m; the remainder, whose airstrips are only about 400 metres long, are fed by a Cessna 180 and a Norseman.

Also based at Shell-Mera are the activities of the Missionary Aviation Fellowship, whose function is to serve protestant missions in otherwise inaccessible areas. MAF have programmes in Brazil, British Guiana, New Guinea and Africa as well as in



Ex-USAF wartime aircraft are still in use in Bolivia. Here is a B-17 operated by the national airline, Lloyd Aereo Boliviano

Left, Beech D-18S used for photographic work by the Colombia Ministry of Public Works. Right, one of the 30 Faucett-Stinsons constructed some 15 years ago and still in service with Companio de Aviacion "Faucett" SA in Peru

Light Aircraft in South America . . .

Ecuador, where their work has extended over the past 14 years. At present, twelve locations in the central jungle region are served by a Piper Cub and a Cessna 180.

Colombia. It was to this State that the early enterprises of the German SCADTA in 1919 gave the distinction of having the oldest airline in the Americas, and since then the country has retained a leading position in South American aviation. Now SCADTA's successor AVIANCA operates an extensive domestic and international system of services with 50 aircraft.

A wholly owned AVIANCA subsidiary, Aerotaxi, serves areas which are inaccessible to the larger aircraft. Regular services from Cali, Villavicencio, Bucaramanga, Medellin and Barranquilla are flown, in addition to charter work undertaken throughout the country. Last year approximately 100,000 passengers were carried by Aerotaxi's 15 Beavers and 4 Cessna 195s.

AVIANCA also hold 51 per cent of Helicol's stock, the Keystone Helicopter Corporation owning the remaining 49 per cent. The main use for the fleet of 23 Bell 47s has been the support of the oil companies' seismic crews, but last year the fumigation of cotton was started and has developed rapidly. Now 12 of the Bells can be equipped for spraying, and they are competing favourably with conventional fixed-wing aircraft. Helicol's claim of an average utilization of 1,200 hours per year on their helicopters gives an idea of the opportunities available for this type of aircraft in Colombia. (Another large helicopter flight is used by Petroleum Helicopters de Colombia, whose 12 Bell 47s are engaged on survey work.)

Many farmers have their own aircraft or use the facilities of the numerous air-taxi companies, and the seven aero clubs in Colombia have 76 aircraft affiliated to them. In addition there are four schools which train pilots to commercial standards. The largest of these schools is the government subsidized ENACC (The National School of Civil and Commercial Aviation), where 21 pupils are currently undergoing training on 17 aircraft, most of which are Piper Super Cubs.

Both ENACC and Aeroclub Colombia, the largest club, are based at Guaymaral Airport, near Bogota, where the Colombian Piper distributors, Aero-Mercantil Limitada also have their headquarters. Piper sales are still averaging 40 units per year despite the cancellation in 1955 of a preferential rate of exchange for light aircraft, and severe import restrictions introduced two years ago which limit imported aircraft to those used for agricultural or instructional purposes.

In Colombia, as in any country where competition in agricultural flying is keen, a price war has developed. Despite a government standard minimum charge equivalent to 18s per hectare, prices as low as 5s are sometimes charged. Cotton and, more recently, banana plantations are sprayed. There are two seasons for cotton spraying, March to August in the interior and September to January on the coast. Reasonable utilization can therefore be obtained from aircraft used solely for fumigation work, and the Piper Pawnee has been introduced successfully. The Pawnee is slowly dispelling the prejudice that undoubtedly exists among pilots accustomed to flying Super Cubs and other high-wing aircraft. For the spraying of bananas, the rotary-atomizer type of spray gear is becoming more popular, since the smaller droplet size available with this equipment minimizes leaf-burning.

In the vast market for light aircraft which exists in South America, Piper, Cessna and Beechcraft distributors today have no serious competitors. Agricultural, taxi and private flying, already well developed in many parts of the continent, will continue to provide an increasing market for the sale of suitable machines, particularly as the economies of the South American republics become more stable and as their capital resources expand.

PNEUMATIC SERVICING FACILITATED

DEMANDS for accurate tyre inflation, rapid pressurization of airborne storage bottles and accumulators and the servicing of undercarriage systems increasingly tend to saddle the aircraft maintenance engineer with a multiplicity of test boxes and panels.

To meet the need for a single piece of pneumatic-servicing equipment combining the virtues of mobility, wide application, safety and simplicity, I.V. Pressure Controllers Ltd, of 683 London Road, Isleworth, Middlesex, have produced a new unit known as the Mobile Air-distribution Panel. Easily handled by one man, this compact 2½cwt trolley distributes air or nitrogen with extremely accurate pressure outputs ranging from 5 to 3,500lb/sq in.

One of the new I.V. units in use for servicing a BEA Comet 4B

The main air or nitrogen supply is fed to a common inlet connection and distributed through three separate output channels to two outlet connections for flexible hoses. Broadly, the requirement is broken down into (a) tyre inflation and (b) general servicing. Thus on one side of the trolley a panel is devoted to tyre inflation and on the other side there is a combined panel giving the complete range of pressure outputs. Each panel is provided with a flexible delivery hose with its appropriate connector. Housed in independent pannier trays, these hoses can be left permanently attached to the trolley.

In each panel is a gauge on which can be read the aircraft pressures so that each service can be tested before being topped-up to the desired level. The required pressure is set on the appropriate controller and indicated on another gauge. Then, by simply pressing the lever of a supply valve, the operator can top-up the aircraft service and be safe in the knowledge that the preset level will not be exceeded.

Provision has been made for the stowage of 50ft of high-pressure hose on the inlet side, whereby the unit can be coupled to the main supply in the hangar or servicing bay. This hose is connected to an input valve which has isolating valves and a pressure gauge, making it possible to select the required service by opening the appropriate stop valve and allowing pressure to the control panel in use. A 20-micron filter is incorporated in the inlet side of the system. Principal operating data are as follows:—

Low-pressure line (¼in bore, ¼in BSP outlet connection): min pressure, 5lb/sq in; max, 250lb/sq in.

Intermediate-pressure line (⅜in bore, ¼in BSP outlet connection): min pressure, 25lb/sq in; max, 750lb/sq in.

High-pressure line (⅜in bore, ¼in BSP outlet connection): min pressure, 500lb/sq in; max, 3,500lb/sq in.

Straight and Level

DOWN come BEA's air fares again. The reductions are most marked on domestic routes, and it all makes me, as a taxpayer, very worried.

Not about BEA, but about British Railways. I only hope that there is someone in the British Transport Commission who realizes that during the next five years BEA is going to give British Railways the biggest beating of its life. Within five years perhaps 75 per cent of all British Railways' trunk-service passenger traffic from London to the Midlands, Scotland and Ireland will be travelling by BEA Vanguard. And the air fares will go down, down, down.

The recent 100-page Parliamentary select committee report on British Railways virtually ignored air competition. It's hard to believe, isn't it? And when, last spring, *Flight* asked British Railways for statistics of traffic-growth on domestic trunk rail services, we found to our astonishment that nobody knew.

Meanwhile, whenever railwaymen or seamen strike for the higher wages which—indirectly because of air competition—their managements can't afford, the air operators are only too delighted to carry the stranded goods and customers.

Press on regardless, airlines. Try not to cry, you taxpaying subsidisers of British Railways. Just as Monty had a portrait of Rommel on the wall of his HQ, perhaps General Sir Brian Robertson will hang up on his office wall a portrait of Lord Douglas.

● As the picture below suggests, a colleague recently visited a certain famous Vulcan squadron in *Flight's* Gemini. As he parked the aircraft his eye caught sight of the Vulcan's cooling-air intake just above the nosewheel door; and immediately he had the solution of how the Vulcan in the Air Ministry recruiting advertisement (see this page, October 7) came to find itself over the Wrong Bridge.

On a standard Vulcan, as you can see, this intake is on the port side, but on the one in the Air Ministry's picture it was to starboard. The same applies to the axe, fire extinguisher and first-aid kit. In other words, the Vulcan over San Francisco had actually managed to get itself into reverse, which would easily account for a navigational error of a few miles.

I recommend to the CO of 716 Squadron—the famous Mad Sretsub—that he should return this perverse brute of a Nacluv to Orvas for re-occidentation.

● I watched the first three instalments of the BBC television series "The Flying Years," in which Sir Alan Cobham has been the narrator. These programmes have, I know, been full of irritating inaccuracies, and no doubt they have provided some highly enjoyable viewing for the historical nitpickers—you know, the sort of people who write letters beginning:—

"Dear Sir,—I am shocked that you should perpetuate the popular fallacy that the tail float on Von Soderwasser's 1907 hydroplane was secured with binder twine. As is well known, z-z-z-z-z drone z-z-z-z-z drone . . ."

Who cares. I for one am grateful for the fact that the BBC has devoted so much peak viewing time to aviation. And I appreciate the efforts that the editor, the producer and the director—and Sir Alan—have obviously put into the series. There was perhaps too much of the narrator, and I feel that the programmes should have been live and not—except for the "library material"—canned. But I loved those jerky old films of wobbly Edwardian flying machines at Hendon, and the shots of 1914-18 fighting aeroplanes—particularly the joyous sequence of Sopwith Camels strafing a squadron of cavalry.

I hope that BBC Television will not be discouraged by the nitpickers from offering us more aeronautical features. If they are as good as Ed Murrow's film on Polaris, which BBC *Panorama* showed, they will be very good indeed.

● I am indebted to the BEA flying staff journal *Intercom* for the following excerpt from a 1917 RFC report:—

"Another good month. In all, a total of 35 accidents were reported, only six of which were avoidable. These represent a great improvement over November, when 84 accidents, 23 avoidable, occurred . . .

"The top wing of a Camel fell off due to fatigue failure of the flying wires . . . Sixteen B.E.s and nine Shorthorns had complete engine failures. A marked improvement over November's figure.

Another response to my "retired aeroplanes still in service" inquiries: C-47 and Viking fuselages in use as airport buildings at Aqaba airfield, Southern Jordan

"Accidents during the last three months of 1917 cost £317 10s 6d—money enough to buy new *gaiters* and *spurs* for each and every pilot and observer in the Service."

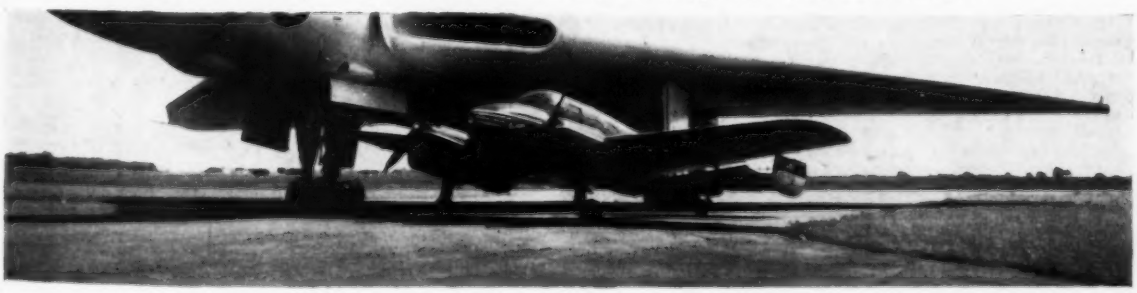
● I remember a colleague telling me how, in his student days at de Havilland, he was asked one day to take an hour off from his work in the factory to help sweep the Hatfield apron clean of oil and to sprinkle it with sawdust. The occasion was a visit by Queen Elizabeth the Queen Mother and Princess Margaret.

I think you may agree, looking at the picture on page 684, that it is regrettable that someone didn't clean up the apron at Gatwick before the arrival of the King and Queen of Nepal on their recent State visit.

● KLM, I hear, have recently set up what they call a Supersonic Steering Group. The name of the secretary is Mr J. Boom.

ROGER BACON

"Flight's" Gemini helps solve the Riddle of the Vulcan Over The Wrong Bridge. See second item in col. 1



A twin-engined conversion of the Beech Bonanza, this Super-V was produced by Bay Aviation Services of Oakland, California, and is currently being piloted on a worldwide demonstration flight by Chuck Banfe. It is here pictured at San Francisco before the official start of the world tour at Honolulu. A degree of advertising support had apparently been enlisted

Sport and Business

RECOMMENDATIONS made in the Air League of the British Empire's report on British general aviation (see page 628 last week) have to commend them that, in the main, they are an endorsement of the best of a rising tide of other people's recent ideas.

But it is reasonable to ask now if the League is able to produce arguments to support in detail the general recommendations that it advances. Suppose that the official interest and blessing for which private flying has been striving so hard was suddenly granted? After battering at the doors of this bastion for so long, would be know which way to turn once we were inside?

It is proposed here to examine some of the League's recommendations (in italics, below) and to advance some proposals for the next stage of detailed examination. Of course, these essential next steps cannot be accomplished without some really hard work, and it is here that private and business pilots must look to the Royal Aero Club and to the ABAC to continue the really valuable work that the Aviation Committee and the Standing Joint Committee and Private and Club Flying and Gliding have done in the past year. *Flight*, too, hopes from time to time to weigh in with detailed proposals, such as those set out, for example, in the issue of March 25, 1960, for a Private Pilots' Air Pilot.

Freer use of RAF airfields, e.g., at weekends when they are normally closed and greater use of disused airfields.

To be decided here is the necessity for providing reasonable safeguards. A case which must be considered is where an accident occurs at a disused airfield. If a very low probability of accident or fire can be accepted, no standing airport watch should be necessary. Perhaps all that is needed is a telephone near the airfield perimeter and occasional MoA inspection of disused aerodromes to see that they remain unobstructed.

Provision of three of four common radio frequencies for private fliers. Encouragement to manufacturers to provide a cheap, lightweight radio suitable for small aircraft.

Considerable MoA sympathy for this view—which has been strongly argued within the Joint Committee on Private and Club Flying and Gliding—is believed to exist.

Adequate radio navigational aids appropriate for General Aviation.

We know what these aids should be: VDF and VOR. Speedy installation of more VORs would be welcomed by all airspace users but, in the meantime, the VDF coverage should be made as wide as possible on the common frequencies available to club pilots.

Procedures to give the private pilot access to control zones in IMC through an extension of the Free Lanes system coupled perhaps with an improved method of identifying them; a unified Government air traffic control service; and airways minimum height to be kept as high as practicable. Free air space below 1,500ft in control zones except near big airports, provided that R/T contact is maintained with area control or airport approach control.

This is the greatest unresolved issue of all, and the next big step to be tackled for the advance of general aviation. Here is a splendid opportunity for an experienced and imaginative air traffic control officer to devise for Great Britain a new system of controlled airspace that would serve—and safeguard—both commercial and general aviation. This is not a matter initially to be decided in committee; before that stage is reached a new airways blueprint is needed on which committee and user arguments can be based.

Also, to some extent, the first and last of the League's recommendations are in conflict; with free airspace below 1,500ft except in the vicinity of major airports the necessity for free lane access to aerodromes in control zones would largely disappear. The "free lower airspace" suggestion is one of Mr Peter Masefield's six fundamental points of policy for general aviation (see *Flight*, September 30); close examination of its practicability might be a useful first step in determining a new controlled airspace pattern for the United Kingdom.

Pilots and flying organizations should within a reasonable period accept R/T as a minimum requirement to be carried and become proficient in its use.

What is a reasonable period? Perhaps January 1, 1962, might be set as a target date for all aircraft flying in (or under) control zones to be radio equipped, and by January 1, 1964, it might be necessary that all aircraft on cross-country flights should carry radio. These dates will obviously be tied-in with the "grand-slam" air traffic control plan.

All interests in General Aviation should combine to create their own recognized organization which can speak with one voice for them all.

The recent work of the Royal Aero Club's Aviation Committee under the chairmanship of Mr Peter Masefield, and the club's contribution to the Standing Joint Committee on Private and Club Flying and Gliding, have done much in the past year to enhance its claim (*Flight*, March 25, 1960, page 418) to represent—by membership and affiliations—all aspects of general aviation. The ABAC have also been most energetic in support of the clubs, but it seems fair to ask if the latter's declaration that "It neither requires nor permits anyone else to speak for it, nor does it desire to speak for anyone else" is, in the context of the supposition in paragraph two, now a sufficiently flexible approach?

RETROSPECT

From "Flight" of October 29, 1910

Town Planning and Aeroplane Stations: One of the speakers at the closing meeting of the Town Planning Conference held at the Guildhall, waxing enthusiastic on the use of armoured concrete in constructing dwellings, pointed out how easy it would be to arrange roof gardens and terraces, and said that they could later on be used as landing-stages for aeroplanes. When flying machines had been further developed, he said, aviators would be able to fly from one terrace to another, starting and landing as they pleased. He concluded by saying that in the cities of the future would be erected magnificent towers to call the flying giants from all points of the horizon, and possibly ere long the great capitals would erect higher and higher their lofty beacons to attack the stormy clouds themselves.

INSTALLING A HIGH-COMPRESSION Gipsy Major 1C of 140 h.p. in an Auster J1N caused the London School of Flying at Elstree considerable difficulties in obtaining type certification. The trouble was mainly that an extra 100 r.p.m. is available on the climb of this aircraft, which was converted for the School by Auster Aircraft Ltd, and this gave rise to suspicions that cylinder-head cooling might not be all that was desired. However, limits were found to be within the tolerance and the aircraft has now been cleared. The initial rate of climb of over 1,000ft/min, says David Ogilvy, manager of the School, "comes as something of a shock to those accustomed to a Cirrus Minor."

The annual dinner of Elstree Flying Club is this year to be held at the Sparrow Hawk, Glengall Road, Edgware, on Friday, November 18.

MORANE-SAULNIER'S Rallye demonstrator which was shown in Great Britain during August has recently completed a tour of Holland, Denmark, Norway, Sweden and Germany. One hundred and eighty-two flights were made and 195 pilots sampled this French 2-3-seater. At the factory at Tarbes tooling-up is now well under way and production of the first aircraft should be complete early next spring.

A VISCOUNT DELIVERED to Mrs Herbert A. May of Washington, DC, has been converted to an executive interior by the AiResearch Aviation Service division of the Garrett Corporation. Accommodating 22 passengers with a crew of five, the interior has been completely remodelled with fabric coverings for the furniture copied "from the furnishings of an old French chateau."

THIRD ANNUAL EXHIBITION and competition of aviation paintings and drawings at the Kronfeld Club, London, will be held during November 2-9. Details are obtainable from Mrs. J. R. Bonham, 44 Belsize Square, London NW3. The competition judging will be by Roy Nockolds, who will officially open the exhibition at 8 p.m. on Wednesday, November 2.

CORRESPONDENCE

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns. The names and addresses of the writers, not for publication in detail, must in all cases accompany letters.

Red-tape Measures

THE Government red-tape measures that you rightly publicized recently (September 30, p. 550) is not confined to passengers alone; crews too have recently been confronted with a new form, albeit by a different department. The form, devised by Customs and Excise, is claimed to speed up Customs procedure—which in their opinion (probably working to one of Parkinson's Laws) it does in fact do.

My own personal experience is that it has taken far longer on the whole, and that, since the clearing is done on board the aircraft, the operators are unable to service or tow away until Customs procedure is through.

However, the operators have no one to blame but themselves in this case, since it is with their collaboration that the system was instituted. As for us I know the third interested party, the crews, were never consulted.

Meanwhile, while I read of passenger complaints and frustration, perhaps HM Commissioners would consider the introduction of this form for all returning UK residents since they are so convinced of the time saved. On the other hand, perhaps the scream of public outcry would be too great even for this Government department.

St Albans, Herts R. BARNARD

The First Night Flight

ALL historians will be delighted to see Mr Nettleinghame's fascinating piece of history (Correspondence, October 14) which came straight, as it were, from the horse's mouth. An added interest to me lies in the fact that the note is not in Henri Farman's hand, and is a translation of what Farman must have said to the writer; Farman then signed it. At that time Farman could speak next to no English, despite the fact that he was to remain of British nationality until 1937. But as he said, "I consider myself a Frenchman in every acceptance of the word" (in a slightly odd translation of his French!).

By the way, there is still an unresolved claim to be dealt with here, about the first night flight. The French claim that Henri Farman himself made the first night flight earlier than spring, but I cannot so far find out the date on which he is supposed to have made it. I am pursuing the French authorities with raucous cries of "Grahame-White did it first in the early morning (2.50 a.m. I think he started) of April 28, 1910," and I will report if and when the French can produce a date for your distinguished expatriate Englishman.

London W1 CHARLES H. GIBBS-SMITH

Poetic Penance

Apologies to Charles Gibbs-Smith.
I fear I need a spanking
For failing to distinguish
Brooklands' pull-up from the banking.

However, one thing made my day.
I never thought I'd find him
Agreeing that any but the Wrights
Would shun "the wind behind him."

Surbiton, Surrey YOUR REVIEWER

[A comment on the final paragraph of the letter from Mr Gibbs-Smith published in our issue of October 14.—Ed.]

"The Flying Years"

I WAS pleased to see that your correspondent Mr Geoffrey Dorman (*Flight*, October 14) drew attention to the myth concerning Gustav Hamel's nationality, perpetuated in the above television programme.

Old-timers remember Hamel as the foremost pilot of the day, and if he *had* disappeared into Germany he would certainly have come into prominence in the months which followed August 1914. In fact, he was not heard of again and was drowned in the Channel.

It was a custom in those days to fit a more powerful (and heavier) engine into an aircraft to improve racing qualities. Sometimes it broke up the airframe and, in any case, it impaired the gliding angle. It was fairly obvious that Hamel left Villacoublay on his racing Morane-Saulnier and that, over the Channel, his engine cut, giving him no chance whatever, and his body was not seen till some time later. He was the son of a Danish doctor and flew for Great Britain.

It seems incredible that a programme purporting to be a history of flying should contain so many clangers. For instance, we were told that we were seeing a Sopwith Pup squadron in France and were promptly shown a Sopwith 1½-Strutter two-seater. Pups I flew were—as always—single-seaters.

It was indicated that the 20lb bomb was standard, whereas in fact that 20-pounder was merely a type of bomb sometimes carried with the more standard 112lb HE bomb.

There were several more clangers and the so-called early history certainly did not highlight the outstanding events. What a pity, especially since there were all sorts of "credits" given for research! Was there any?

Potters Bar, Middx A. H. CURTIS, ARAeS

True Ultra Lights

SO Mr David Armstrong, chairman of the Popular Flying Association, the ostensible stalwart of Great Britain's ultra-light aircraft movement, wants to postulate as inadequate power-units below 90-100 h.p. Surely in this day and age, it is high time a really ultra-light aeroplane, with power-unit developing little more than about 5 h.p., was incorporated in a man-powered-type machine.

Mr Armstrong, in his enthusiasm, overlooks the fact that the engines and spares he wants us of the ultra-lights to abandon are obtainable from Rollason of Croydon, whose ultra-light beauty, the Turbulent, using their Ardem engine of about 30 h.p., only recently won the King's Cup.

London NW10 DOUGLAS USHER

Erasmus Darwin's Prophecy

IT might interest your readers to know that although Tennyson is often given the credit for having foretold the aeroplane with his airborne argosies "dropping down with costly bales," it was Charles Darwin's grandfather Erasmus who made prior reference to it in the following verse:—

Soon shall thy arm, unconquer'd steam! afar
Drag the slow barge, or drive the rapid car;
Or on wide-waving wings expanded bear
The flying chariot through the field of air.

Bury St Edmunds, Suffolk FREDA MAY ARNOLD (MISS)

Retired Aeroplanes

I NOTE on page 479 of your September 16 issue that Roger Bacon requests knowledge of other retired aircraft "continuing to render service." Although it has been a number of years since I have seen it and it may well have long since passed out of existence, I do know that from along about 1932 or so until past the end of World War 2 one of the old Fokker F-32 four-engined transports used by Western Air Express between Los Angeles and San Francisco was used as an automobile filling station. I should be able to give you the exact address, but I have been away from the Los Angeles area now for more than a dozen years, and I wouldn't want to be guilty of making a misstatement. I am sure, however, that some of your correspondents, such as this character Tom Towers you have mentioned, would be able to give you the history of that particular intriguing installation.

There were only three F-32s built, if I remember correctly, and the four engines were mounted two in tandem on either side of the monstrous box-like fuselage. It is said it wasn't much of an airplane, but it made one hell of an impression on me as a neophyte airport engineer in the San Francisco Bay area, and gave me an inkling of things to come.

We here at "Arizona's Airport" enjoy *Flight* very much and always seek "Straight and Level" as the first order of reading.

Tucson, Arizona R. W. F. SCHMIDT, A.A.E.
Executive Director, Tucson Airport Authority

P.S. There's an airplane in Fairbanks, Alaska, I believe a B-17, in use as part of a night club called the Squadron Club. It was in active service when I left Fairbanks in 1954.—Sandy Duckett (Mr Schmidt's secretary).

Memories of the A. V. Roe Triplane

I WAS interested in the reproduction, in your issue of September 30, of the painting by Christopher Storey of the A. V. Roe triplane on Hackney Marshes in 1909.

I was one of Mr Roe's helpers from 1908 until towards the end of 1909 and I am able to point out a number of discrepancies in this painting. In the first instance the No 1 arch from which the machine is being wheeled was the first one in which the ends were boarded up and this was in fact the first arch which A. V. rented from the railway. Subsequently he rented No 2 hangar, which is shown as being boarded in, some time later.

Secondly, I notice two spectators on the railway embankment

CORRESPONDENCE . . .

and would point out that this was in fact purely a railway track with no wall, and obviously nobody was permitted up there.

Thirdly, it was in 1908 that the old 9 h.p. triplane did in fact succeed in getting off the ground on the marshes. In the evening of this momentous day A. V. and myself sat in his one-roomed digs in Hackney and about 1 a.m. finally decided on a name for it, which we painted on the next morning, the name being "The Avroe Plane."

There is no doubt in my mind that the figure on the right in his shirtsleeves was undoubtedly intended to be A. V., since this was the attire in which he always worked other than when he had a cow gown on. The other two figures are, of course, not recognizable but they are probably a man named Paine (who previously had done many parachute drops from balloons at the Alexandra Palace) and myself. The machine is at the present time in the Science Museum in Kensington and includes a lot of the work which I personally did on it.

Incidentally, I wrote A. V. Roe's obituary for the *Aeromodeller* after his death.

Birchington-on-Sea, Kent — H. J. TAPLIN, Lt-Col

Record Passenger Loads

IN helping Mr Bateson (Correspondence, August 19) obtain information on "record" passenger loads, I should like to submit as a world record a flight made in a Martin Mars of the US Navy during May 1949.

This aircraft carried 301 persons (I do not know if this included flight crew) non-stop from the San Francisco area to San Diego, a distance of about 500 miles. These persons were adults and probably all naval personnel. Can anyone better this?

Mexico City — RAUL LOPEZ

Received from America

THE following unsigned communication has been received from an address in San Antonio, Texas. It is printed verbatim—including the footnote—from the original parchment.—Ed.

THE TRIAL OF FRANCIS POWERS

(*Tune: The Battle Hymn of the Republic*)

by Red River Dave

In the stately "Hall of Columns" nineteen-sixty was the year,
When young Francis Gary Powers stood before the Russian bear.
They were trying him for spying, o'er the Soviets he flew
In the famous plane, U-2.

Glory, Glory, he's a hero! Glory, Glory, he's a hero!
Glory, Glory, he's a hero who flew for Uncle Sam.

Far across the foreign waters in the State U. S. S. R.
O'er the Lubyanka prison shines a bright forboding star.
In that "Godless" land of Russia, in that "vale of endless tears,"
They gave him ten long years.

Glory, Glory, he's a hero! Glory, Glory, he's a hero!
Glory, Glory, he's a hero who flew for Uncle Sam.

In the future page of hist'ry, in the ages yet to come,
When "Free Men" speak of their heroes and the deeds that they have done.
They will sing of Francis Powers and the famous plane he flew
For the great "Red, White and Blue."

Glory, Glory, he's a hero! Glory, Glory, he's a hero!
Glory, Glory, he's a hero who flew for Uncle Sam.

NOTE: This song may be reproduced by Newspapers, Civic Clubs and schools for group singing. For radio and TV performance, kindly credit Medallion Music, A.S.C.A.P. (Recorded by Red River Dave, Savoy Record No. 3023.) Americans! Printed on Lifetime Parchment, suitable for framing.

THE INDUSTRY IN BRIEF

W. H. Sanders (Electronics) Ltd announce the following executive appointments made within their group: Mr R. G. Roberts, formerly chief sales engineer, becomes sales manager; Mr R. M. Baerlein, previously sales engineer, is made senior sales engineer.

A new senior position has been created in the overseas division of the Dunlop Rubber Co Ltd with the appointment of Mr A. E. Durling as overseas sales manager. He will be primarily concerned with tyre exports and have his headquarters in St James's House, London SW1.

The autumn meeting of the Institute of Welding is being held in London from November 1 to 3 at the Institute's headquarters, 54 Princes Gate, Exhibition Road, South Kensington, SW7. The first annual conference on welding standardization is to be held at the Institute on December 7.

Sales manager of the Graviner Aircraft Fire Protection Equipment Division since 1945, Gp Capt R. H. Horniman, CBE, FRAeS, has joined the board of the Graviner Manufacturing Co Ltd. In the inter-war years he was an RAE test pilot and from 1939 to 1945 was Ministry of Aircraft Production overseer at Hawker Aircraft.

Honeywell Controls Ltd have delivered two further multi-point electronic strip-chart temperature recorders for an extension to the Dunlop Aviation Division's aircraft tyre testing section. The instruments will give continuous records of heat generated during 2min runs at peripheral speeds of up to 200 m.p.h. Thermocouple outputs are collected from the wheel by slip-rings.

Westland Aircraft Ltd have appointed Mr Geoffrey Mardon as their resident sales representative in Australasia and all Asia east of Pakistan. Based on Hong Kong, he will co-ordinate the work of existing Westland agents in the area. The appointment is the second of its kind to be made under the Westland Group's world sales programme; Mr Stuart J. Miller has already been appointed group sales representative for the Americas and will shortly be moving from Toronto to Washington DC.

Hawnt & Co Ltd, 112-114 Pritchett Street, Birmingham 6, have been appointed Midland distributors for Winston Electronics Ltd, Shepperton, Middx.

In collaboration with the Maltese section of the firm of C. H. Bailey Ltd, Jablo Plastics Industries Ltd have formed a company in Malta under the name of Jablo Plastics Industries Ltd (Malta) Ltd. It will manufacture under licence the various Jablo products, mainly in the field of expended plastics.

Extensions to the Kings Norton (Birmingham) factory of the Triplex Safety Glass Co Ltd will include a section entirely devoted to the production and development of Triplex gold-film heated glass, production of which has been doubled. The new facility, states the company, will virtually be an aircraft-glass division of the company. A new vacuum vessel is being installed to "sputter" the layer of pure gold on the glass, and an extensive glass-grinding and polishing plant is included.

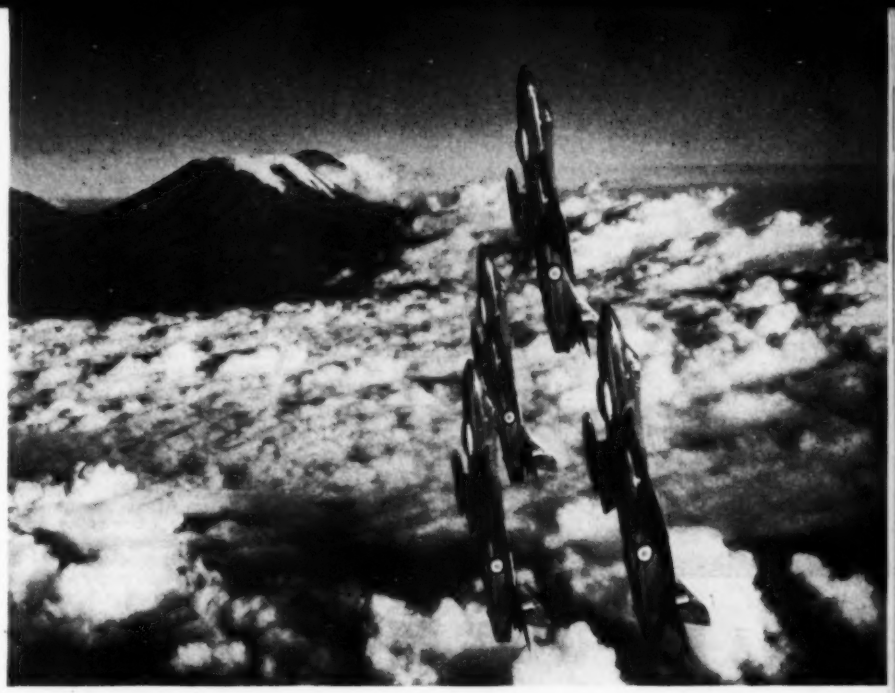
When Gen Norstad, Supreme Allied Commander Europe, visited Alvis Ltd at Coventry recently he was shown a prototype military vehicle, the Stalwart, having cross-country abilities comparable with the Salamander crash tender now used on many RAF airfields. Like the Salamander, the new vehicle can "wade" through rivers, but it can also be used as a true marine craft, using an hydraulic-jet propulsion unit. The latter is likely to be either the Gill unit of this type—to be made by Saro (Anglesey) Ltd for Alvis—or the Dowty.

Vokes Ltd have changed their name to Vokes Group Ltd and a new subsidiary company, Vokes Ltd, has been incorporated to take over the business of the former concern of that name. The board of the Group remains as before; the board of the new operating subsidiary is Sir Ian Stewart-Richardson, BT (chairman), Mr H. F. Osborn (vice-chairman and managing director), Mr C. E. M. Hardie OBE, FCA, Mr D. P. Ringe (general manager), Mr J. Phillips, FCA (secretary) and Mr. A. E. Queering, FCA (assistant secretary).

FORTHCOMING EVENTS

Oct. 28. Surrey and Kent Flying Club: Annual Dinner Dance.
Nov. 1-3. Institute of Welding: Autumn Meeting.
Nov. 3-9. Kronfeld Club: Painting Exhibition.
Nov. 4. Norfolk and Norwich Aero Club: Dinner and Dance.
Nov. 10. Radar and Electronics Association: "VHF Aerial Techniques," by C. A. Burgess.
Nov. 11. RAeS and IEE (joint lecture): "The Future of Electrics and Electronics in Aircraft and Guided Missiles," by Viscount Caldecote.
Nov. 16. Kronfeld Club: Film Show
Nov. 17. Guild of Air Pilots and Air Navigators: Annual General Meeting.
Nov. 18. Institute of Navigation: Symposium on "Navigation for the Early Exploration of the Moon."
Nov. 18. RAeS: Sixteenth British Commonwealth Lecture, "The Story of Indian Air Transport," by J. R. D. Tata.
Nov. 21. RAeS Historical Group: "My First Ten Years in Aviation," by Sir Thomas Sopwith.
Nov. 22. BritIRE (Southern Section): "Radio Aids for Automatic Landing Developed by the Blind Landing Experimental Unit," by J. S. Shayler.
Nov. 22. BritIRE (South Western Section): "Transistors in Control Circuits," by E. Wolfendale.
Nov. 22. RAeS: "Basic Aerodynamic Considerations of V/STOL Aircraft," by P. L. Sutcliffe.
Nov. 23. BritIRE (South Wales Section): "Radio Navigational Aids in Aircraft." (Lecturer to be announced.)
Nov. 23. Kronfeld Club: "The Sea and Sailing," by Mike Gee and Frank Irving.
Nov. 23. RAeS Graduates' and Students' Section: "The British Space Programme," by M. O. Robins.
Nov. 23. Society of Environmental Engineers: Discussion on "Vibration Testing and Instrumentation of Large Stores."
Nov. 25. RAeS Graduates' and Students' Section: Annual Dance.
Nov. 28. RAeS Agricultural Aviation Group: "The Farmer's Viewpoint," by J. B. Farrant.
Nov. 29. Institute of Transport (West Middlesex Group): "Airline Advertising," by A. J. Burkart.
Nov. 30. RAeS Man-powered Aircraft Group: "Some Aspects of Bird Flight," by John Barlee.

RAeS Branch Fixtures (to Nov. 4): Oct. 31, *Boscombe Down*, "Background for Space Travel," by A. F. Collins; *Henlow*, Student Members' Papers. Nov. 2, *Swindon*, "The Radio Telescope," by Dr J. Davis. Nov. 3, *London Airport*, "Helicopters," by Peter Brooks.



Hunter FGA.9s of No 208 Sqn, official aerobatic team of British Forces Arabian Peninsula Command, going up into a loop against a background of Mt Kilimanjaro (19,265ft). Commanded by Sqn Ldr R. Ramirez, who leads the team, the squadron is based at RAF Eastleigh, near Nairobi

SERVICE AVIATION

Air Force, Naval and Army Flying News

Comet 4Cs for RAAF?

IT is understood that the RAAF are "seriously considering" the D.H. Comet 4C as a replacement for the Convair 440s they now operate as VIP transports. The alternative idea, of re-engining the 440s, is not regarded as practical. The Comet order would be for not more than three aircraft, or possibly two, to be delivered in 1963 or 1964.

CENTO Appointment

A NEW post has been announced for Air Cdre Wilfrid Carter, who is the only former RAF administrative apprentice to have risen to air rank: he is to become Deputy Chief of Staff, Combined Military Planning Organization, Central Treaty Organization, in Ankara next month. He has been Senior RAF Director at the Joint Services Staff College since April 1958. During the war, he commanded No 10 Sqn and later No 540, winning the DFC in February 1944.

Admiral Cambell Retires

AFTER a distinguished Fleet Air Arm career, in which he was responsible (in conjunction with a civilian officer) for the conception of the angled-deck system, Rear Admiral D. R. F. Cambell has retired from the Royal Navy. It was during his period as Director of Naval Aircraft Development and Production at Admiralty that his ideas about an angled-deck were put into practice. In 1958 he was decorated by the American Ambassador with the Legion of Merit (degree of officer) for his work; and in 1960 he was made CB. His First FAA post was in 1939 when he commanded No 803 Sqn in *Ark Royal*, and he was awarded the DSC the following year. He was a test pilot at Boscombe Down during 1940 and 1941 and his carrier appointments included those of Commander (Flying) in HMS *Argus* in 1942, Commander (Air) in HMS *Glory* in 1947, and the captaincy of HMS *Ark Royal* when she was first commissioned in February 1954. He became Director of Naval Air Warfare at the Admiralty in September 1956, subsequently becoming Flag Officer Flying Training.

Air Defence Director

FROM December 12 the post of Director of Operations (Air Defence) at the Air Ministry is being taken over by Air Cdre E. J. Morris, who since December last year has been at Fighter Command headquarters as Air Commodore, Operations. A South African, Air Cdre Morris was a fighter pilot during the last war, in the Battle of Britain and subsequently with the Desert Air Force. He won the DSO in the Western Desert in 1941 and the DFC for operations from Corsica. He is also a CBE.

IN BRIEF

An Auster of the Army Air Corps, flown by Maj S. Whitehead and Capt P. Carter, recently made a 9,600-mile flight to Kuala Lumpur in 25 days on delivery to No 656 Sqn.

The first two of ten Grumman Albatross amphibians for the RCAF, for use on ASR operations, were recently delivered by the company.

Flt Lt R. F. Wyatt of the RAAF has been awarded the George Medal for freeing the pilot of a Canberra, in which he was flying as navigator, after the aircraft had crashed on take-off and caught fire.

No 16 Army Light Aircraft Sqn has been formed at RAAF Amberley, Queensland, to provide light aircraft support for the Australian Army. Technical backing and maintenance are being provided by the RAAF.

A Canberra of No 58 Sqn from RAF Wyton and a Canberra of No 5 Sqn, RRAF, delivered special breathing apparatus from the UK to Southern Rhodesia in 24 hours recently. The RAF Canberra flew out to Nairobi with a stop at El Adem and the Rhodesian Canberra took the equipment on to Salisbury, where it was delivered to the Red Cross polio centre.

Presentation of a standard to No 22 Sqn at RAF St Mawgan on Wednesday of last week: Air Marshal Sir Ralph Sorley, reviewing officer, is seen (below, right) giving his address; on his right is AVM L. W. C. Bower, AOC No 19 Group, and on his left Gp Capt W. D. Hodgkinson, station commander. Centre, the CO of No 22 Sqn, Sqn Ldr A. P. Dunn. At left, the new standard being marched past: the ensign is Fg Off J. V. Sherwood, the escorts Sgts C. C. Smith and R. Lewis, and the standard warrant officer (at rear) M Plt G. Watts

"Flight" photographs

Airborne for the first time from Renton on October 14 is the first Boeing 720-048, "St Patrick," for Irish International Airlines. Pending completion of acceptance tests it was due to be delivered last Monday, October 24, and it will be flown to Dublin on November 17. Irish commercial jet services start on December 14

AIR COMMERCE

VC11 AND BAC-107 PARTNERS

ACCORDING to an Australian source a British Aircraft Corporation sales team from Vickers has been discussing with Ansett-ANA and TAA an "ambitious and far-seeing plan" for the re-equipment of these two airlines with jets.

The suggestion is that the two Australian operators should buy a combined fleet of VC11s and BAC-107s to replace Electras and Viscounts on all but the most minor routes from 1964. A possible contract amounting to £30m or £40m is at stake. Both operators are closely studying their future jet plans, with special attention to the Caravelle, it is said, as an Electra replacement.

BEA v. BRITISH RAILWAYS

HITHERTO a BEA domestic one-way ticket costing 100 units single has been priced at 180 units return. What BEA have decided to do as from April 1 next is to abolish this ten per cent discount for a return ticket, and to price a return fare simply as double the single fare. They have done this not by bumping up the 180 to 200, but by reducing the 100 to 90. In other words, the existing return fares in BEA's domestic tariff (first class and tourist) will remain the same, but it will be cheaper—by amounts ranging from 10 to 50 per cent—to buy single tickets on all domestic routes. About 150 fares are affected. For example, a normal tourist ticket from London to Glasgow or Edinburgh at present costs £7 10s single, or £13 10s return. From April 1 the normal single fare is a half of £13 10s, i.e., £6 15s.

At the same time all but a very few of BEA's cheap off-peak "limited-validity" excursions will vanish from the domestic scene. Instead, as from April, off-peak passengers will pay only *half the present excursion fare* to make the one-way journey. For example, it will be possible to fly from London to Glasgow for £4 single at weekends in winter. This compares with the present cheapest single fare of £7 10s. Elimination of these excursions, and the pricing of return fares as double single fares, will result in a major simplification of BEA's domestic fare structure.

The cheapest single fares on the trunk routes (i.e., to Manchester, Birmingham, Edinburgh, Glasgow and Belfast) are now within a few shillings of the normal second-class rail fares. BEA are obviously making an all-out drive for British Railways' trunk-route traffic. The introduction of Vanguards as from April 1, when the new fares become valid, should mean that the newspapers will in the next few years be carrying more and more of the already familiar headlines "BEA Slash Fares Again."

Meanwhile big increases in capacity are planned for BEA's winter domestic services from November 1. There will be 6,600 Viscount seats a week between London and Glasgow compared with 4,100 last winter, an increase of 60 per cent. When the Vanguard is in service the number of seats will increase to 10,500 a week both ways. On the London - Edinburgh route the increases are to 3,400 seats a week this winter—30 per cent more than last winter. By next summer there will be 6,700 seats a week on this route. The London - Manchester services are to get an 80 per cent boost this winter, to 5,600 seats per week in both directions compared with 3,000 last winter. And winter seats on the Belfast route will be 40 per cent up.

Footnote: BEA's *first-class* domestic fares between London and Glasgow, Edinburgh and Belfast are to go up from £16 to £18 return. As with tourist fares, single fares will be half the return fare.

DEUX PONTS FOR SILVER CITY?

SILVER CITY's long silence about their future plans—relieved only by an announcement of their interest in the Handley Page HPR.8 in April—was partly broken last week with their application to the ATAC to operate from March 1, 1961, Continental vehicle ferry services from four provincial centres in Great Britain. According to the terms of the application, Breguet 763 Deux Ponts may be used following an initial period of operation with Bristol 170s. All of the originating points chosen—Leeds/Bradford; Blackpool, Manchester and/or Liverpool; Glasgow and/or Edinburgh; and Newcastle—are served by Silver City's northern division. From each point the company have applied to operate to Le Touquet, Calais or Cherbourg. Another vehicle-ferry application is for the route Newcastle - Amsterdam, on which Silver City now operate a passenger service, and a vehicle-ferry licence is already held for Birmingham - Le Touquet.

In many ways these applications pose more questions about the future of Silver City than they answer. They come at a time when British Government approval for the long-range routes to the Continent, for which both Silver City and Air Charter applied in summer 1959, has at last been granted. Silver City now have Government authority to serve Troyes, Cologne and Pontoise (for Paris), and Channel Air Bridge Lyons, Strasbourg, Dusseldorf and Bremen.

Unlike Channel Air Bridge, who are planning with apparent confidence to operate the Carvair on their deeper-penetration routes to France and Germany next year, Silver City seem pessimistic about receiving French Government approval. Mr Eoin C. Mekie, chairman of Silver City, said in a statement released last Monday that "we believe it may be some time before these licences [for routes 'deep into France'] are approved by the French authorities . . . Our latest move, therefore, is to seek licences to fly cars from the heavily populated, more northerly areas of Britain direct to the near-Continental coast. This will save most people two whole days unwanted driving on the congested roads of England."

Silver City's plans for routes into Continental France figure in further applications put forward this week. The airline is asking for removal of restrictions on incidental passengers and supplementary freight on the vehicle ferry service between Lydd or Manston and Cologne, Pontoise and Troyes. Are Silver City stalling on the deeper-penetration routes to France because they see no prospect of a commercial return under the present ATAC-imposed limitations?

Also apparent is a change of policy towards these long-range routes. Silver City originally intended to operate into France at a low frequency, mainly at night, as a necessary step towards improving the utilization of their Bristol 170s on across-the-Channel services. Although at the present rate of growth over 100,000 cars may be carried on these routes next year, annual utilization has yet to rise substantially above 1,200hr. From a profit-making viewpoint, this is the *raison d'etre* for long-range services. Applications for Northern and Midland ferries each

Some idea of the potential of the Breguet 763 as a car ferry is given by this picture of an Air France aircraft. See note beginning above

Introduced by BEA in the domestic flights department at London Airport is this aluminium and Perspex conveyor for transferring tickets and documents to the flight control desk. It was constructed by the John Thompson Conveyor Company of Wolverhampton

stipulating six return services a day and the eventual use of a new type of aircraft with a capacity for perhaps five cars, show much greater emphasis than hitherto on this type of operation.

Silver City have no comment to make about the references in their application to the Breguet Deux Ponts. The appearance of a particular type in a licence application is not, of course, a guarantee of intention to operate. What can be seen from these applications is apparently only part of a plan which lies—like an iceberg—five-sixths submerged beneath the surface. All that is clear is that Silver City are anxious not to give the impression that this particular French aircraft is an irrevocable part of their equipment plans—plans that have been in a state of flux ever since negotiations for a £5m investment in Silver City by British Railways fell through in the spring. Now there are signs that Britain's second-largest independent is on the verge of springing a big surprise.

Both operators have recorded substantial increases in the traffic carried over their present short-range routes as is shown in the traffic figures below for the year ended September 30.

Year ended September 30		1959-60	1958-59	Percentage increase
Services operated	Silver City	40,000	29,000	37.9
	Channel Air Bridge	16,124	10,840	49.6
Passengers carried	Silver City	220,000*	190,000*	8.7
	Channel Air Bridge	151,322	86,622	74.5
Vehicles carried	Silver City	90,332	67,452	34.0
	Channel Air Bridge	26,435	18,846	40.0
Freight tons carried	Silver City	45,300	34,000	32.8
	Channel Air Bridge	7,140	4,055	76.0

*Passengers accompanying cars

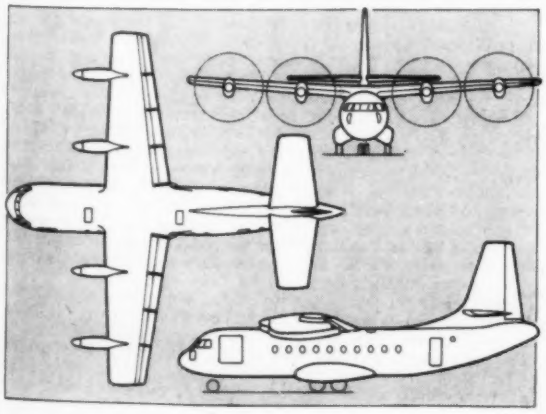
LORD TERRINGTON REPORTS

THE twelfth report of the Air Transport Advisory Council opens on a characteristic note: a whole paper is devoted to the complaints of a passenger who was angry about Jersey Airlines. The scrupulously fair consideration granted by the Council to this storm in a teacup is typical of the sense of fair play that pervades the report and indeed the Council's activities in general. This affair is also a timely reminder of the fact that the ATAC has been largely occupied with the minor problems of British air transport, the more important issues having—until recently—been evaded.

This twelfth report will be the last to cover a full year, it being likely that the thirteenth report will be limited to a period of nine months. These months will be occupied almost entirely in issuing transitional licences to cover next summer's inclusive tour business.

The year was the busiest ever, with applications exceeding 1,000 for the first time. Inclusive tours accounted for 689 of these, while international and domestic scheduled services accounted for 132 and 38 respectively. Amendments to existing licences accounted for about half of the remaining 236 applications. On average, an application just failed to get an even chance of being approved, scheduled services showing a score rather better than par, while inclusive tours showed a tendency to be rejected. Indeed, the Council's action on ITs was even more severe than is apparent from the bald statistics, for the invariably exaggerated demands of prospective tour operators were usually cut down sharply.

As usual, the report provides a useful commentary on the development of British air transport. The continued growth of corporations and of independents leads the report to declare roundly that "the Council do not consider that the operations of independent companies have to any material extent adversely affected the growth of the traffic of the corporations." Yet perhaps the most striking feature of the year was not a rise but an apparent reduction in inclusive tour traffic: the independents' IT business fell at a time when tourism was booming. The demise of a major IT operator, Independent Air Transport, was largely the cause of the fall. But also significant was the rapid rise in BEA's IT traffic —much of it on normal scheduled services and, of course, there was a good deal of unrecorded "unofficial" IT business flown by certain independent operators (see *Flight*, April 8, page 468). A note on the ATAC's views about "spurious" group travel appeared in our first review of the report the week before last.



TWO-YEAR AGREEMENT ON FARES

THE principal achievement of the IATA traffic conference which ended in Cannes on October 18, after its one-month meeting, was that fares shall be valid for a two-year, instead of as hitherto a one-year, period. This decision is described by the chairman of the meeting, Mr V. H. L. Dubourcq of KLM, as "a major step towards greater stability in the industry. It is a sign that we are nearing the end of the revolutionary transition from propellers to jets." It may not, he says, be possible to eliminate a 1961 conference entirely; but the new two-year agreement should "considerably compress the sessions, reduce their costs and effect substantial savings in tariff publications and sales procedures."

In general the Cannes fares become effective on December 1 or April 1, and are valid until March 31, 1963. Among the more important decisions were:—

(1) The New York - Buenos Aires return tourist fare is to be reduced by a swingeing 36 per cent—from $934 to $599 by jet. Tickets for propeller travel on this route are to be 10 per cent less, having previously been six per cent less. This is a real economy-class fare, brought about largely by the rate war, and PanAm hope to offer it as from January 1. First-class fares go up 10 per cent.
(2) The Pacific is now "closed," with economy-class services to be offered over the northern and central Pacific from December 1 at fares 14 per cent below existing tourist levels. Economy-class fares are thus now available on all the world's long international routes. First-class fares on the Pacific go up slightly. Special group rates offering cuts of 30 per cent are available for off-peak periods.
(3) There is to be a meeting in the spring to pool experience with the 17-day North Atlantic excursion fares which went into effect on October 1, with a view to considering possible further reductions. North Atlantic economy passengers are now to be served with hot meals.
(4) There is to be a special IATA conference on January 23 next, at an as yet unspecified place, to discuss "new approaches to cargo rating to encourage greater bulk traffic"—primarily over the North Atlantic.
(5) The jet v. propeller differential is now firmly embedded in the IATA fare structure. All fares are based on jets, with a differential either in price or comfort for propeller aircraft on long hauls.

In a statement last week BOAC welcomed the fact that IATA has agreed to reduce fares for group travel to the Middle East. As for BEA, the Cannes conference allows reductions in the off-peak month of October to holiday resorts mainly in Spain, Portugal and Italy of between 17 and 23 per cent. Travellers during the peak summer months to these holiday resorts can also get discounts of between two and 13 per cent if they fly at off-peak times, but "popular-time" weekend travel to Valencia and Lisbon is to be cheaper, too. All first-class fares in Europe are to go up by 5 per cent.

This is what the Breguet 942, the pressurized production version of the 941, will look like. The 942 differs from the 941 only in its pressurized circular section fuselage. Up to 50 passengers can be carried. Powerplant consists of four Turbomeca Turmo IIID turboprops of 1,250 h.p. each. Passenger cabin is 30ft 8in long, 9ft 7in interior width, 6ft 6in high; hold volume is 350 cu ft. Weights are as for the Breguet 941. [*Breguet 945: see note on page 684*]

This was the scene at Gatwick Airport on October 17 when the King and Queen of Nepal arrived in this country by BEA Viscount 806 (Capt James Munro) on the occasion of their State visit. Their Majesties King Mahendra and Queen Ratna had flown from Paris

AIR COMMERCE . . .

WHEN IN ROME, FLY IFR

ALL flights in the Rome control zone must be in accordance with IFR plans, and cancellation of IFR flights will not be accepted. This is made official—though it has been in force *de facto* since the Viscount-Boeing 707 near miss on August 11—in Italian Notam No 440/60, dated October 11.

Special provision has, it is believed, been made for some Alitalia domestic flights to operate VFR, but these are conducted along specified routes and with prescribed reporting procedures. It is on record that both airlines involved in the incident over Rome on August 11, BEA and Pan American, are agreed that Rome ATC implemented the procedures correctly. The responsibility, according to a statement issued shortly after the accident by the Italian authorities, rested with the Pan American 707.

The Boeing captain, it is now clear, had cancelled his IFR flight plan and was descending VFR towards beacon LJ at the same time as the BEA Viscount had levelled out following a 40° left turn to pick out the outbound leg of the holding pattern. It was only the prompt action of the Viscount commander, Capt James Bell, that averted what could have been a major disaster.

AND NOW THE BREGUET 945

A SMALLER-SCALE version of the Breguet 942 STOL airliner (see drawing on page 683) is now being planned. Designated Breguet 945, it will weigh about 20,000lb and will be powered by two Turbomeca Turmo IIIBs (the Breguet 942 will have four of these turboprops) and have a payload of about 3,300lb for a range of more than 900 st miles at almost 240 m.p.h. The 945 is claimed to be able to take off and land on hot and high airfields with strips of less than 300m (1,000ft).

This project is as yet only under study, and it is understood to have a blown wing and to embody the same high-lift principles as the Breguet 942. A photograph of the Breguet 941, precursor of the production 942, appeared on page 624 of *Flight* for October 14.

WHAT IS SIXTH FREEDOM?

THE point on which the US and Scandinavian civil aviation authorities appear most to differ is the definition of sixth freedom. As previously reported (*Flight*, September 23, page 517) the Americans are concerned about the amount of SAS traffic from the US bound for destinations beyond Copenhagen.

There is no generally accepted definition of the US-coined expression sixth freedom, but it is usually understood to mean (to take the case of SAS as an example) traffic picked up in New York which is ultimately destined for a point beyond Copenhagen. But now the Americans maintain that this is a form of fifth freedom, and therefore subject to "Bermuda Agreement" regulation.

For example, in the American view, a passenger who buys a ticket in New York for, say, Rome is in the fifth freedom category whether or not he flies via Copenhagen.

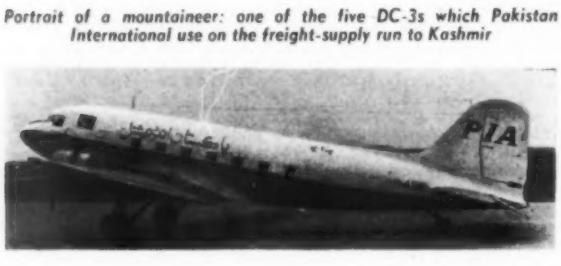
The Scandinavians maintain that such a passenger flies from New York to Copenhagen as a fourth freedom passenger under the US and Scandinavian bilateral agreement, and from Copenhagen to Rome under the Scandinavian-Italian agreement as a third freedom passenger. They maintain that beyond-Copenhagen traffic is no concern of the US.

PIA PROFILE (continued from page 671)

turboprop should bring in regularity and over-the-top operation, the aircraft will also answer a popular demand for something more modern. This—so the story goes—comes only twelve years after the villagers who came out to greet the first aircraft asked "When does it mate, and how big are the eggs?"

While the cargo is unloaded we take our first look at a Kashmiri village: a market rich with fruit; Russian and Chinese bowls for sale in the shops; and a village gaol populated not by thieves ("no one would steal anything here") but, we are told, "only by murderers." There is trout fishing here and scenery without compare, but thoughts of away-from-it-all holiday idylls are dispelled by the news that the clouds are expected to close in and that we must take off at once if we hope to return to 'Pindi that night. This time our pilot is Capt Aziz, a senior DC-3 pilot with hours and experience which would have equipped him long since, had he wished it, for more exotic commands. With him, we are to fly the direct route, leaving the Indus valley earlier to cross the Bahusa pass and follow the Kaghan valley over to Safal Maluk lake, famous since the days of the Arabian Nights. Climbing up through the valley from Gilgit, at 14,000ft we go on to oxygen and Capt Aziz, who loves the mountains and knows the route perhaps better than any other pilot, grins at me and says that if Nanga Parbat is clear he will show me a sight I shall always remember—the naked lady of the mountains. As host of these inhospitable lands his disappointment is great when abeam of Nanga only the snowy peak is visible, impossibly high above the filling cumulus clouds. The sculptured lady of the snows is wrapped again in her chilly white purdah.

Portrait of a mountaineer: one of the five DC-3s which Pakistan International use on the freight-supply run to Kashmir



At 16,000ft we leave the valley and plunge out across the pass, its peaks fresh with newly fallen snow. With only a load of empty jerricans we have ample power in hand, but traversing the pass with a loaded DC-3 means that for five long minutes the aircraft is over a ridge so high that should an engine fail there might be no return. If the morning flight was through the valley of the rocks, the direct route we are following now is through the peaks of the snows and, as a reminder that the weather can never be forgotten for long, a snow shower from the gathering clouds above accumulates on our leading edges. Mountain eddies rock our wings and pluck briefly and playfully at the controls, and as we crest a ridge we drop sharply with a sudden jolt. Off to the left lies Mulka Barbet and ahead blue, glacial lakes of startling beauty. Below, an eagle wheels, as we disturb for a moment the solitude of his craggy domain.

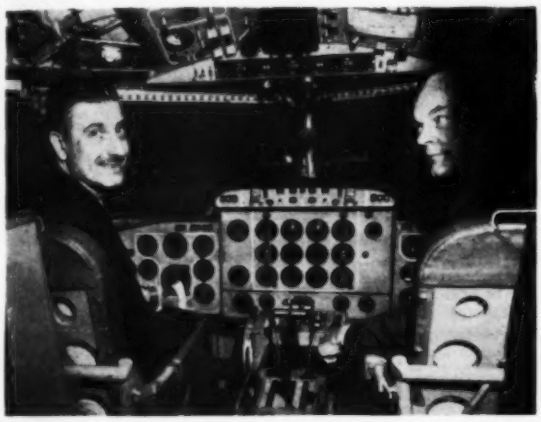
One by one the snowy peaks recede. With them, something of the astonishing elation of this mountain flying departs. It affects not only me as a first-timer but, as we leave the mountains, the crew who have done this journey so many times before, seem to feel it too. We drop down to the plains past Abbotabad and Murree to land in Rawalpindi's warm evening sunshine.

TURNING A PAGE OF COMET HISTORY

NOW that BOAC's Comet 4s have been withdrawn from the North Atlantic service (see *Flight* last week) it is appropriate to look back at the record of two years' operation.

The Comet 4 was not, of course, designed as a North Atlantic aeroplane, being better suited to shorter-range routes where its operators could benefit from the higher frequencies possible from its smaller size. But despite their limited design range, BOAC's Comet 4s completed 92 per cent of the eastbound (tailwind) crossings non-stop. Westbound they completed rather more than 100 flights non-stop, about 10 per cent. The total number of crossings both ways between October 4, 1958, and October 16, 1960, was 2,304—an average of just over three a day. Initially, two aircraft operated one service a week but by the summer of 1959 this had increased to a peak of two services a day. On-time arrivals (within 15min) were made on 73 per cent of all London - New York flights and 89 per cent of these services arrived within an hour of the scheduled time. There were no in-flight engine failures, and only on one occasion—following trouble with a fuel control unit—was an engine shut down.

In all, and on the routes from London to Montreal, Toronto and Boston, BOAC's Comets carried 94,000 passengers and achieved an overall passenger load factor of 74 per cent. Perhaps the most encouraging statistic is that, on all routes, BOAC's Comet utilization is now 10½hr per day.



Recently at A. V. Roe's airfield at Woodford to see the 748 is, left, Brig Miguel Moragues, president of Aerolineas Argentinas. With him is Mr J. R. Ewans, Avro director and chief engineer

ICAO IN THE CONGO

THE fact that civil aviation in the Congo has not collapsed entirely is due in large measure to ICAO technical assistance. When the official in charge of this aspect of ICAO's work arrived in the Congo on July 25, he found the most pressing problem was to ensure the continued operation of Leopoldville airport following departure of practically all the Belgian staff. The immediate help of the French authorities in Brazzaville was sought and given, personnel being flown back and forth across the Congo each day. But the help that ICAO has so far given has had to be limited, due to the shortage of trained staff, to Leopoldville, Stanleyville and Luluabourg. The eventual plan is to have ICAO staff at 21 airports in the Congo other than Elisabethville and two airports in Ruanda-Urandi which are still Belgian-operated. Owing to the lack of surface communications quick transport within the Congo is completely dependent upon aviation.

The ICAO team in the Congo comprises 26 people, of whom eight have been recruited from Canada, six from Tunisia, four from France, two from Spain, two from the UAR, one from West Germany, one from Greece, one from Sweden, and one from the USA. Congolese personnel are being trained to take over as soon as they are able—but ICAO estimate that about 56 more experts and technicians will have to be recruited to do the job properly.

BOAC'S BIG DECISION

"It is possible to see, almost every day on the ramp at London Airport North, one of Pan American's converted DC-7Cs taking aboard freight that could just as well be going aboard a converted BOAC DC-7C."—Flight, March 4, 1960, page 320.

IT was last June that BOAC applied, for the second time in 18 months, for a licence to operate a transatlantic all-cargo service. (The first application had been withdrawn in deference to Airwork, the licence-holders.) At the same time a competitive application was filed by Cunard Eagle. Both applications have now been approved by the Minister, and BOAC's first-ever transatlantic all-cargo service will leave London for New York during the last week of next month.

The fact that BOAC have already sent two of their ten DC-7Cs to Douglas for conversion to DC-7F all-cargo configuration was never announced, perhaps because the corporation did not want to appear to be taking the Minister's decision for granted. The first DC-7C, G-AOII, arrived in Santa Monica on September 8 and the second, G-AOIJ, on September 26. The first is due to be delivered in November, and the second in December, by which time the service frequency will be increased from one to two per week. (The original application was for a twice-weekly service initially, rising to daily flights later.)

In converting their surplus piston passenger liners to all-freight configuration, BOAC are doing what ten others have done, as shown in the following table:—

Airline	Type	Quantity	Conversion by	Approx. cost	Date of order	Timescale
PanAm	DC-7C	10	Lockheed A.S.	£1m	Sept. 59	In service
United	DC-7	10	Douglas	£1.78m	Jan. 59	In service
American	DC-7B	15	Douglas	£2.3m	Jan. 59	In service
Air-India	L.1049G	3	Lockheed A.S.		Sept. 59	In service
Eastern	L.1049C	5	Lockheed A.S.	£0.35m	Feb. 60	In service
Lufthansa	L.1649A	2	Lockheed A.S.		Feb. 60	
Skyways	L.749A	3	BOAC		Oct. 59	In service
KLM	DC-7C	2	Douglas		Apl. 60	One in service
Panagra	DC-7B	1	Douglas			
JAL	DC-7C	2	Douglas			
BOAC	DC-7C	2	Douglas	£0.25m	Sept. 60	Nov.-Dec.

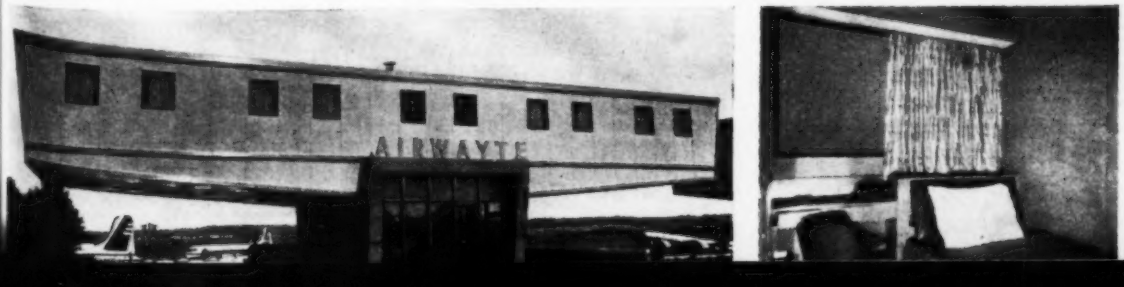
When the corporation ordered their DC-7Cs in 1955 they were obliged, due to Britannia politics, to give an "express undertaking" that these aircraft would be sold for dollars when the Britannias were in full North Atlantic service. But BOAC needed their DC-7C capacity, and much later, during 1959, BOAC asked the Minister to let them keep their DC-7Cs until their Boeing 707s were delivered, on condition that the DC-7Cs were then re-exported for dollars.

Now BOAC have applied for, and have been granted, Government permission to convert two of their ten DC-7Cs to DC-7F standard. Instead of re-exporting these aircraft for dollars, the corporation is now spending more dollars on them. BOAC decline to reveal the cost of the conversion, but it is probably about 400,000 dollars per aircraft. (Cost of the DC-7F conversions ordered by American Airlines in January 1959 averaged $425,000 per aircraft; those ordered by United Air Lines cost $500,000 per aircraft.) The work specified is for the fitting of big doors fore and aft and a strengthened floor; the pallets-and-rollers DC-7F system described on page 621 of *Flight* for October 14 is not being supplied.

What of BOAC's remaining eight DC-7Cs, which are no longer in scheduled service? A BOAC spokesman emphasized last week that efforts to dispose of these for dollars are not being relaxed. During the past year or two the corporation's Seven Seas have been employed on group charter business, particularly across the North Atlantic. On average, it is said, two such charters a day were flown throughout the recent summer season. The DC-7Cs flew their last scheduled service on August 14, 1960.

BOAC are of course likely to have plenty of surplus Britannia 102 and 312 capacity to apply to charter business, but there are as yet no plans to convert any of these turboprops to all-freight use. Thus unless BOAC's all-freight business develops rapidly, and more DC-7Cs are converted to DC-7Fs, the corporation will still have a difficult surplus-aircraft disposal problem on its hands. The book-value of eight DC-7Cs is probably more than

"The ideal short stay or overnight accommodation for businessman or family . . . perfect for work, or relaxation between flights . . . private bath with every room. . . ." This is one of the new "Airwayte" hotels near the terminal building at Washington National Airport



An impression of BOAC's new DC-7F. A note on the corporation's North Atlantic all-cargo plans is concluded below

AIR COMMERCE . . .

£4m, so that to avoid a heavy capital loss these will have to be sold for $1.4m each—an unlikely prospect (see footnote).

Less than two years ago BOAC were saying that, by using the cargo hold capacity of passenger aircraft, they would adequately meet the needs of the North Atlantic freight market "in the next few years." Since May the cargo holds of the Boeing 707 have already nearly doubled BOAC's transatlantic freight capacity. The corporation operated 10½m freight ton-miles across the Atlantic in the year ended June 1959—one quarter as much again as in the corresponding period in the previous year. And it is estimated that, taking the IATA airlines as a whole, 1960 will see a 40 per cent jump in transatlantic cargo traffic. But it is salutary to see from recent MoA traffic statistics that BOAC's load factor on western routes dropped three percentage points, from 55.4 to 52.5, during the first six months of 1960 compared with the corresponding period last year. This is entirely due to the bigger cargo c.t.m.s produced by the 707.

On the face of it, BOAC would appear to be taking a big financial risk in preparing now to offer an all-cargo service. But there are two points to bear in mind here. First, all-freight DC-7F services when offered with passenger-cum-freight 707 services will enable BOAC to launch an all-out cargo sales campaign in the knowledge that any backlog of freight from the 707 services can be carried on the supporting all-freight services. And, of course, the corporation will be able to accept loads which are too bulky for the 707. Second, on January 23 next there is to be a special IATA conference to discuss drastic reductions in cargo rates, particularly across the North Atlantic. How drastic will these cuts be? In order to get air freight rates down to sea freight levels, the cuts will have to be of the order of 80 or 90 per cent below existing rates. This must be the sort of reduction that BOAC have in mind, because anything less drastic is not likely to attract the really big cargo breakthrough which their DC-7F decision appears to anticipate. J. M. B.

Footnotes: No details were available as *Flight* went to press of Canadian Eagle's plans also to operate a North Atlantic cargo service, presumably with DC-6As. According to BOAC, the two services will not be in competition.

Also, Douglas are to convert to DC-7F standard the seven ex-SAS DC-7Cs bought by Riddle from General Dynamics Corporation (*Flight*, October 14, page 621). Cost of the conversion is said to be $300,000 per aircraft. Purchase price was $750,000 each.

SOVIET SUPERSONICS IN 1965?

TO the US *Aviation Daily* we are indebted for the following quotations attributed to Mr E. R. Quesada, administrator of the American FAA, who was in the USSR from September 15-October 4 with a team of colleagues on an exchange visit:—

"Head of a ten-member US technical exchange group which flew to Moscow September 15, Quesada returned to Washington late Tuesday with no new hopeful signs on the rocky road to US-Soviet relations. Although Aeroflot 'wants to come over very badly' and the Soviets are 'working like beavers' to catch up to US operation and maintenance standards, Quesada holds resumption of bilateral talks to be still solidly blocked by the RB-47 incident. The FAA administrator also learned that:—

"The Soviets' Il-18 turboprop, 'by far the best they've got,' has been plagued by engine trouble—fuel injection problems—and apparently has been grounded for a retrofit program. But it is, nonetheless, 'a very good airplane.'

"The Tu-104 jet, in contrast, is a prohibitively (by US standards) uneconomical transport 'with stick control forces equivalent to the B-17.' The Soviets 'have them coming out of their ears,' and are using them 'the width and breadth' of their country—'to very good effect' over the vast expanses of Siberia.

"The Soviets are obviously both interested in and reluctant to talk about a supersonic transport. Quesada's impression: 'They'll have a less-than-Mach 2 transport, and I wouldn't be surprised if they do it in five years.'

"Although Aeroflot has its own roughly comparable ILS and GCA at its international field at Moscow, British European Airways must line up two simple radio beacons there and home on them. There is a US-type, British-built ILS on the way. Smaller airports have sub-par or crude navaid and passenger facilities. Traffic control is antiquated, airline maintenance often 'meagre.' Only the Russians' 'very good' approach lighting system, where available, stacks up with the West's.

"Fourteen daily Moscow - Leningrad roundtrips represent the USSR's heaviest single route today. Its load factor goal is 80 per cent."

A new apron-service vehicle, Samlesbury Engineering's "Cargoveyor," has a hydraulically elevated and operated baggage loader which moves at 1.5ft/sec. The vehicle has a capacity of 580 cu ft

BREVITIES

It is reported that the Brazilian airline VASP may purchase up to five Caravelles.

The annual banquet of the Guild of Air Pilots and Air Navigators will be held at Guildhall on Tuesday, April 11, 1961.

Deutsche Taxiflug has received the first two of its four Dornier Do 28s. The aircraft are fully equipped for IFR operation and will be operated on charter and feeder services in West Germany.

Described by an official Soviet source as a "half-sized Tu-104 with 44 passenger seats," the Tu-124 turbofan feederliner is to be built "in considerable numbers." Cruising speed is quoted as 500-530 m.p.h.

A lecture entitled *The Operation Of The Air Ferry* will be read to the metropolitan section of the Institute of Transport, 80 Portland Place, London W1, by Mr W. G. Franklin, director, Silver City Airways, on October 31.

The possibility of a weekly service between London and Budapest by both Malev and BEA arises from the talks that took place in London last week between the MoA and the Hungarian civil aviation authorities. The Il-18/Viscount service may start on April 1 (see *Flight*, July 15).

The first four of the six Caravelles on order for Sabena are due to be delivered from January next, the last two being scheduled for delivery in June. Sabena are planning to start European Caravelle services in the spring.

It is reported that the DHC-4 Caribou (two Pratt & Whitney R-2000 twin Wasps of 1,450 b.h.p. each) may be re-engined in a version for the US Army with two T64-GE-4 turboprops of 2,700 e.s.h.p. Weight is 1,079lb and cruise s.f.c. is 0.54.

The Swiss operator Globe Air of Basle has bought an Ambassador from BEA at an undisclosed price and is to start operations in the middle of November. According to *Interavia*, Globe Air was registered in 1957 with a capital of SFrs 50,000, which was increased to 410,000 in May and will be increased to one million this month.

The Flight Safety Foundation's 13th Annual International Air Safety Seminar will take place in Phoenix, Arizona, from November 14-18, 1960. The seminar is being held in co-operation with the Flight Safety Foundation's aviation crash injury research division. More information is available from the FSF office at 468 Park Avenue South, New York 16, NY, telephone Lexington 2-2466.

BOAC announce that the following have been appointed directors of BOAC Associated Companies: Mr B. W. Bampfylde (general manager, eastern routes); Mr K. W. Bevan (financial comptroller); Mr D. H. Glover (general manager, southern routes); Mr J. Linstead (general manager, BOAC Associated Companies); and Mr J. R. Stainton (general manager, western routes). Present members of the board are: Mr Keith Granville, chairman; Mr Basil Smallpeice; Sir George Cribbett; Sir Duncan Cumming; Mr J. C. Dykes; and Mr G. G. Money.

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